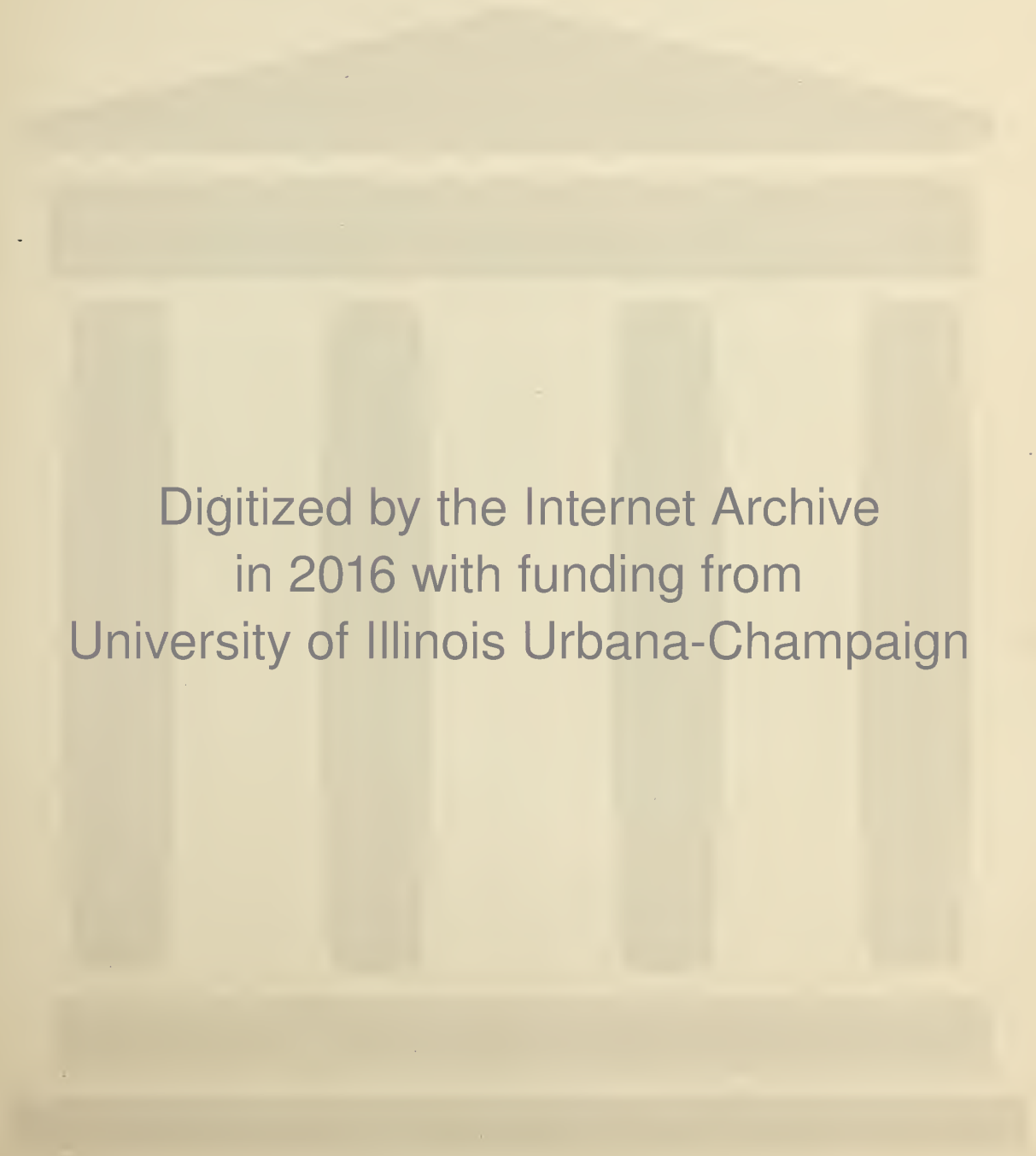


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John Brown
Grates

W. Glaser, Brooks & Co

Argand
Blowers



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McCLAVE GRATES

AND

ARGAND BLOWERS.



McCLAVE, BROOKS & CO.

MAIN OFFICE AND WORKS:

301-311 SEVENTH STREET,

SCRANTON, PA.

JULY 1, 1899.

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Cheap Fuel.

IN this age of close competition, the subject of cheap fuel for boiler furnaces has become a question of vital importance to manufacturers who use steam for power, hence any device that will enable the consumer to burn this class of fuel satisfactorily is certainly worthy of attention.

It is a well known fact that to obtain the best results from the cheaper grades of fuel, such as anthracite birdseye, rice, bituminous slack, screenings, duff, etc., a grate especially adapted for this purpose must be used, also that a forced blast will produce better combustion than a strong natural draught.

The well known McClave Grate and Argand Steam Blower, which have been on the market for several years, as devices for burning all kinds of cheap fuels, have made a remarkable record. Profiting, however, by the years of experience in this particular line, we have made several improvements in the McClave Grate, which are embodied in what are known as McClave's Improved Grate and McClave's Perfect Grate.

The Improved Grate, which is described on page 4, has been on the market for about four years, and has more than fulfilled our expectations in regard to it. The Perfect Grate, described on page 17, we are just introducing to the public. As will be seen by the cuts, it has the same general lines as the Improved Grate, the difference being in the construction of the grate bars, whereby we are enabled to give the consumer an almost indestructible grate, and one that can be adapted to any style of furnace.

A description of our Improved Argand Steam Blower will be found on pages 32 to 37.

We are always pleased to enter into correspondence with parties interested in the question of economy in cheap fuels, and we will be glad to give any information gained from our long experience that may be desired.

Requesting a careful perusal of the following pages, we remain,

Respectfully,

McCLAVE, BROOKS & CO.

McClave's Improved Grate.

PATENTED MAY 19, 1885, AND NOV. 13, 1894.

This Grate has been adopted throughout by many of the largest concerns in the country, such as Steel Mills, Wire Mills, Paper Mills, Steam Heat and Electric Companies, Packing Houses, Pipe Lines, Collieries, etc., etc. It combines more valuable features for burning hard or soft coal, especially the smaller sizes, than any other grate.

POINTS OF EXCELLENCE.

- (1) The fire surface is especially adapted to prevent the waste of fine unconsumed fuel.
- (2) In its thorough shaking movement there is no increase in the size of openings.
- (3) The shaking movement is adapted to break up a soft coal fire when it cakes, or to remove fine ashes from a hard coal fire when there is but little or no clinker formed. (See Plate 2.)
- (4) It has an absolute cut-off movement that removes clinkers instantly, when free burning fuel which does not produce large slabs of clinkers is used. (See Plate 3.)
- (5) It will clean a fire uniformly from front to rear by operating each entire row as a whole, and leaves no uncleaned part at the bridge wall.
- (6) All the foregoing movements can be made with fire doors closed, thus preventing cooling down of the furnace by cold air.
- (7) Each row or section of grate bars is divided into a front and rear series by means of two separate connecting bars, operated by twin stub-levers and connecting rods, with an operating handle adapted to grasp either one or both of the levers in such a manner that the front and rear series may be operated separately or together. This provides for cleaning out the worst kind of clinkers without wasting the unconsumed fuel on the surface, as that may be shoved over on the stationary part while the clinkers and ashes of the other series are being cut through into the ash-pit. (See Plates 4 and 5.)
- (8) Another new feature is the expansion top journal bearing bars, each consisting of a paneled bar proper, and a continuous series of separate locking caps and key plugs, which prevent the grate bars jumping out of their journal bearings while cleaning the fire, and also prevent the journal bar from warping, as it presents short lines of metal in contact with the fire, with expansion spaces between them. (See Plate 1.)
- (9) The grate bars proper are constructed on the best known principles to prevent warping and burning out. The pendant or supporting rib is cut down on a bevel below its top edge between each finger, and instead of each finger being separate, they have a tie cast between each pair at the front to strengthen them, with a space between to prevent warping.
- (10) These grates are made with different sized meshes to suit the various sizes of fuels, the smallest mesh being $\frac{3}{16}$ inch, and yet retaining all the air space necessary for most perfect combustion. This small mesh is especially designed for the smallest sizes of anthracite, such as "birdseye," etc.
- (11) **McClave's Improved Grate in combination with McClave's Improved Argand Blower**, forms the most complete system for burning the cheaper grades of anthracite and bituminous coals, such as rice, birdseye, buckwheat, slack, screenings, duff, etc., while the grate alone is unequalled for burning the large sizes of either variety of coal by natural draft.

This construction will bear the closest inspection and expert investigation. **Its Use Will Prove Every Claim Made for it.**

For furnaces less than 5 feet in length, the Grates can be fitted with Single Lever connections for whole cut-off movement, as per Plate 9. Generally the width of the grates is made with two or more rows of grate bars, hence the live fire can be shoved sidewise from one row to the other without trouble when cleaning, when the grates are short. We therefore recommend the single lever connections for furnaces up to 5 feet in length, and if the coal used is a free-burning variety, which does not make much clinker, or for soft coal, the single lever may be used for a furnace 5 feet long.

Directions for Ordering McClave's Improved Grate

FOR A BRICK SET FURNACE.

1. Give the exact width between side walls of furnace at the level of grate.
2. Give length of lines A A and B B, Fig. 6, Plate 7.
3. State whether the dead plate has a rabbet on its inner edge to carry front end of grate frame, as shown on Fig. 6, Plate 7, or whether a separate bearing bar is used instead. If it is a separate bar and very deep in cross section, it may interfere with the connecting rods, and in such case it will be necessary to use our special front bearer (see Fig. 4, Plate 7). We regard a rabbet on the dead plate as the best arrangement, as it not only stiffens the inner edge of dead plate, but also affords more clearance for the connecting rods. The rabbet for McClave's Improved Grate should be $2\frac{1}{2}$ " projection by $2\frac{1}{8}$ " in depth (see Fig. 5, Plate 7).
4. Give distance between doors as per Plate 18. These measurements determine as to how the grate can be constructed, and it is therefore important that they should be sent with every order.
5. Always state whether the grates are to be fitted with twin levers for divided cut-off movement, as per Plate 1, or with single levers for whole cut-off movement, as per Plate 9; also state the kind and size of fuel that is to be burned.
6. To measure for a locomotive type of boiler, see Plates 19 and 20.

Directions for Ordering Repairs for McClave's Improved Grate, Fitted with Twin Levers for Divided Movement.

GRATE BARS.

Give the length of bar on top, not including the journals, and state whether they are **Crescent, Heel, or Regular** grate bars (see Plates 1 and 6), and whether they are **Right or Left Hand or Center Pull** (see Plates 22 and 23).

FRONT AND BACK FRAME ENDS.

In ordering front or back frame ends, give full length on top, not including dove-tails. (See list of lengths below.)

JOURNAL BEARING BARS.

In ordering journal bearing bars, give the length as per line B B (Fig. 6, Plate 7), and state whether the front nib is like Fig. 6, or lower down, as at front end of Fig. 1, Plate 7. (See list of Lengths below.)

CONNECTING BARS.

In ordering connecting bars, give the length of journal bearing bars, as per line B B (Fig. 6, Plate 7), and state whether for front or rear series of grate bars.

FORGINGS AND FITTINGS.

Order according to letters, as shown on Plate 1 for Twin Lever connections.

For grates fitted with Single Levers, see Plate 9 for proper names of levers, connections, etc.

List of lengths of Frame ends, not including dove-tails :

13½"	14½"	16¼"	18⅛"	19"	21⅛"	22⅛"	23½"
24⅛"	26¼"	27⅛"	30⅛"	32"	33"	35"	

NOTE.—Corresponding grate bars are about 3-16-inch less in length.

List of lengths of Journal Bearing Bars :

Measurements to be taken as per line B B (Fig. 6, Plate 7).

2' 6"	3' 0"	3' 6"	4' 0"	4' 6"	5' 0"	5' 6"	6' 0"
6' 6"	7' 0"	7' 6"	8' 0"	8' 6"	9' 0"	9' 6"	10' 0"

The above lengths include allowances for expansion at front end, *i. e.*, $\frac{3}{8}$ ". We can make grates any width desired.

Grates up to 4 feet wide should have about $\frac{1}{4}$ " expansion room each side of the grate. Grates wider than 4 feet should have about $\frac{3}{8}$ " expansion room each side of the grate.

Directions for Setting McClave's Improved Grate.

WITH TWIN LEVERS FOR DIVIDED CUT-OFF MOVEMENTS.

Each entire grate consists of one or more sections or rows of grate bars. These sections are not always of equal width, but are arranged to suit the width of the furnace. A sketch or diagram showing the arrangement of the sections will be mailed to the purchaser. When there is more than one grate in a shipment, the pieces of frame belonging to each separate grate are lettered A B C, etc., and as the journal bearing bars, frame ends and grate bars are shipped loosely, it would be well to sort out the frames of each separate grate and put them together outside the furnace before commencing to set them; also pick out the heel bars, crescent bars and regular grate bars that have holes in the lower journals for split pins. The heel grate bars are always marked with a cross (thus X) with white paint, and their lower journals are drilled for split pins. The regular grate bars at the front and rear terminals of each series are also drilled for split pins to secure connecting bar to. These regular grate bars are marked with white paint in a straight line lengthwise of top surface.

Next find the names of the different parts (see plates 1, 6 and 7).

Then put the back bearing bar on the bridge wall so that the top of it will be on a horizontal line with the front rest or rabbet on dead plate. Then put in the frames which you will find marked with center punch as follows: The journal bearing bars on the top edge at each end, and the frame ends on the top at the end. The journal bearing bar with one dot at each end should be placed on the left-hand side of the furnace (as you stand facing the boiler front). The journal bearing bar with two dots goes next to that, etc., and the frame ends should be placed to match the journal bearing bars, driving them down with a hammer until their top surface is level with top edge of journal bearing bar. The back ends of the journal bearing bars hook on to the back bearer to prevent the grate from working about while being operated.

Always allow at least $\frac{3}{8}$ -inch space at front end of grate for expansion room, as the grate, being locked at the rear, must have room to expand forward. After the frame is in place, then complete the bridge wall, bringing it forward 4 inches on the top of the back frame end (see Plate 1 and Fig. 6, Plate 7). Also put the front liners in place (see D, Plate 1).

Next put in the crescent grate bars, then the heel grate bars, and then fill up the back series of each row with regular grate bars, having bars drilled for slit pins at front end of series. Then fill in front series of each row with regular grate bars, taking care to have bars that are drilled for split pins at front and rear ends of each series.

Next put the keepers over the journals of the crescent bars, then place the caps and key plugs all along the top edge of each bar, taking care to place the special cap over heel bar journals, and special key plug between heel and crescent bars. Then put on the connecting bars, using small cotters for the $\frac{1}{2}$ -inch bolts in wrought iron extension that couples crescent bar to rear connecting bar. Next put the eye bolts in the connecting bars and line through to the front for connecting rod holes.

After locating the holes, drill and tap them as per Plate 8, and screw in the fulcrum strap studs and latch studs. Then put the rod through, connect straps, and put the latch pins in place; then screw on the eye bolts far enough to make the grate bars level when the latch is holding both rods in their proper position outside the front, after which split all the pins and see that every part is in its proper place, and be sure that each row of grate bars work easily to full extent of movements, either as entire section or in separate series before regarding the job as completed. For thin fronts we send steel eyelets to insert in the connecting rod holes through the front. When these are used, drill the holes $1\frac{1}{2}$ -inch in diameter for the connecting rods, and when they are not used, drill the holes $1\frac{1}{16}$ -inch in diameter.

DIRECTIONS FOR SETTING McCLAVE'S IMPROVED GRATE, WITH SINGLE LEVERS FOR WHOLE CUT-OFF MOVEMENT.

The directions for setting the grates with single levers are the same as for the twin levers, with the following exceptions, viz., after the frame is erected, and the crescent and heel grate bars are in place, then fill up each row complete with regular grate bars, taking care to have the bars drilled for split pins at the front end of each row.

The holes in the front for the levers should be located as per plate 10; then drill and tap them, screw in the fulcrum jaws and stops, and attach the fulcrum straps and stub lever. Then put the rod through the hole in the front and screw the eye bolt far enough on the end of the rod so that when the grate bars are in their normal position (i. e., level) the stub lever will rest against the shoulder on the stop, as per Plate 9

Directions for Using McClave's Improved Grate,

WITH TWIN LEVERS FOR DIVIDED CUT-OFF MOVEMENT.

To Shake.—Place the operating handle on both of the stub levers, disengage the latch and vibrate the grate back and forth between the boiler-front and normal position of stub levers, *i. e.*, inwardly until the shoulders of the rods strike the front (see Plate 2), and then return to normal position. Repeat as often as necessary, always adjusting the latch to hold both rods at the finish.

Caution.—This movement should never be made by using each series separately.

Cut-Off Movement.—To remove clinkers and give the fire a thorough cleaning when the coal does not clinker badly, place the operating handle on both levers, disengage the latch, and pull the operating handle out as far as it will come, *i. e.*, until the grate bars strike each other; then return to normal position. This will break up the clinkers; then vibrate the grate smartly back and forth so that the stub levers at the connection of the rods will move about two inches each way, inwardly and outwardly, past the normal position; repeat as often as necessary, always adjusting the latch to hold both rods at the finish. For some kinds of fuel it may be necessary to vibrate more than two inches each way—this can be learned, however, by experience.

To clean a fire when the fuel clinkers badly, shove the unconsumed fuel on all the front series of grate bars back on the rear series of grate bars; then arrange all the latches to hold the rear series stationary; place the operating handle on the stub lever that operates the front series of grate bars, and with the full cut-off movement cut all the ashes and clinkers into the ash-pit, doing the same with each front series. Then change all the latches so that they will hold each front series level, and pull all the unconsumed fuel forward on to the front series; then place the operating handle on the stub lever that moves the rear series and cut all the ashes and clinkers into the ash-pit as before; then adjust the latches to hold both connecting rods and redistribute the unconsumed fuel. This gives a thoroughly-cleaned fire without wasting any fuel, and it is quickly and easily done.

Directions for Using McClave's Improved Grate,

WITH SINGLE LEVERS FOR WHOLE CUT-OFF MOVEMENT.

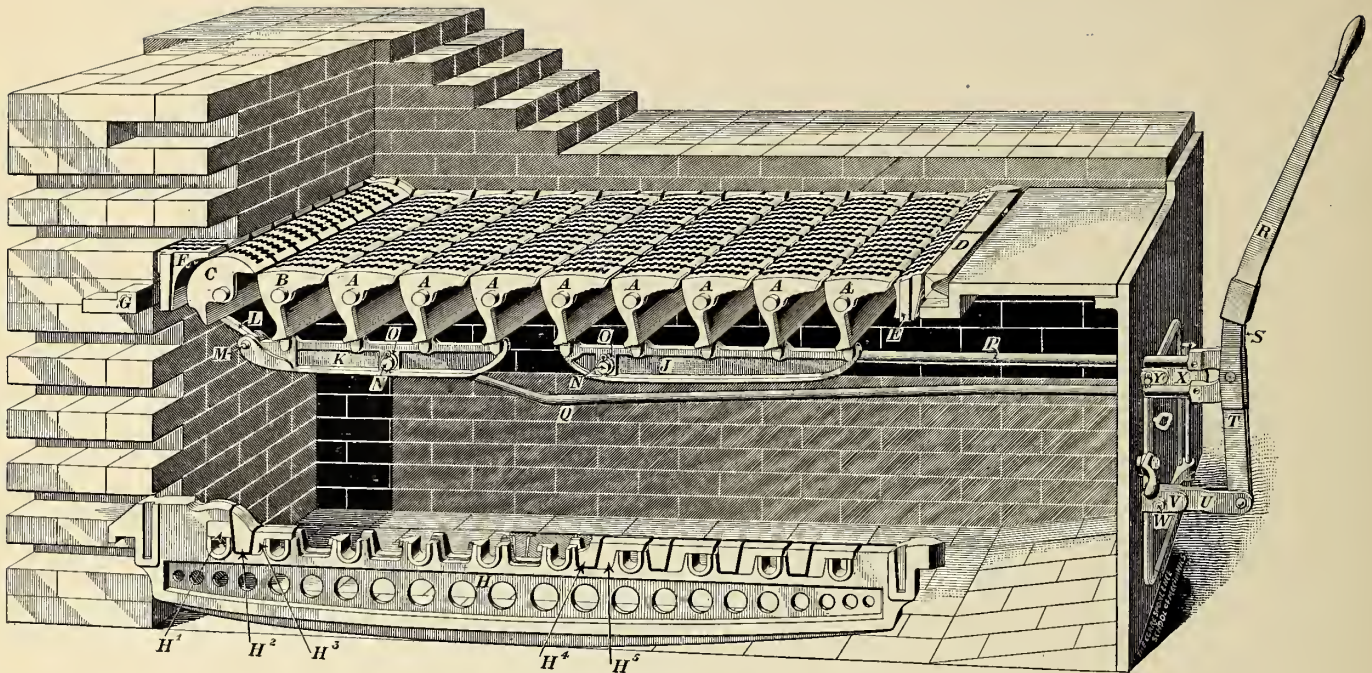
To Shake.—Place the operating handle on the stub lever and move it back and forth between the boiler front and the stop as often as necessary, always finishing with the lever resting against the shoulder on the stop, as this indicates when the grate bars are level. There is no danger of losing the fire at any point in the shaking movement, as there is no increase in the opening.

Cut-Off Movement.—To remove clinkers and give the fire a thorough cleaning, when the coal does not clinker badly, place the operating handle on the stub lever, throw the lever to one side so that it can pass the shoulder on the stop, and pull it forward as far as it will come, *i. e.*, until the grate bars strike each other; then return to normal position. This will break up the clinkers; then vibrate the grate quickly back and forth so that the stub lever will move about two inches each way past the shoulder on the stop; repeat as often as necessary, always leaving the stub lever against the shoulder on the stop at the finish. For some kinds of coal it may be necessary to vibrate more than two inches each way—the fireman can soon determine, however, as to which movement will produce the best results.

The single lever connections are used for grates less than 5 feet in length, and the width of the grates is generally made in two or more rows; therefore, to clean a fire when the fuel clinkers badly, the unconsumed fuel on one row can be shoved over on the other row, and with the full cut-off movement the clinkers and ashes can be cut down into the ash-pit; then shove all the unconsumed fuel on to the clean row of bars and cut the clinkers down the same as before; then redistribute the unconsumed fuel over the whole grate.

This gives a thoroughly-cleaned fire without wasting any fuel, and as the grates are so short, the work is easily and quickly done.

PLATE NO. 1.



ONE ROW OR SECTION OF McCLAVE'S IMPROVED GRATE,

Fitted with Twin Levers for Divided Movement, with the grate bars in their normal position, and having one journal bar removed to show end view of grate bars, also the arrangement of the connecting bars and connecting rods.

All the pieces in this view are designated by letters, and are named and described as follows :

A, Regular grate bars.	H³, Heel bar cap.	Q, Connecting rod for rear series.
B, Heel grate bar.	H⁴, Regular key plug.	R, Operating handle.
C, Crescent grate bar.	H⁵, Regular grate bar cap.	S, Stub lever for front series.
D, Front liner.	J, Front connecting bar.	T, Stub lever for rear series.
E, Front frame end.	K, Rear connecting bar.	U, Fulcrum strap.
F, Back frame end.	L, Connecting bar extension.	V, Fulcrum stud or jaw.
G, Back bearer.	M, Bolt for extension.	W, Bolt for fulcrum stud.
H, Journal bearing bar.	N, Eye bolt.	X, Latch.
H¹, Crescent bar keeper.	O, Washer for eye bolt.	Y, Latch stud.
H², Rear key plug.	P, Connecting rod for front series.	

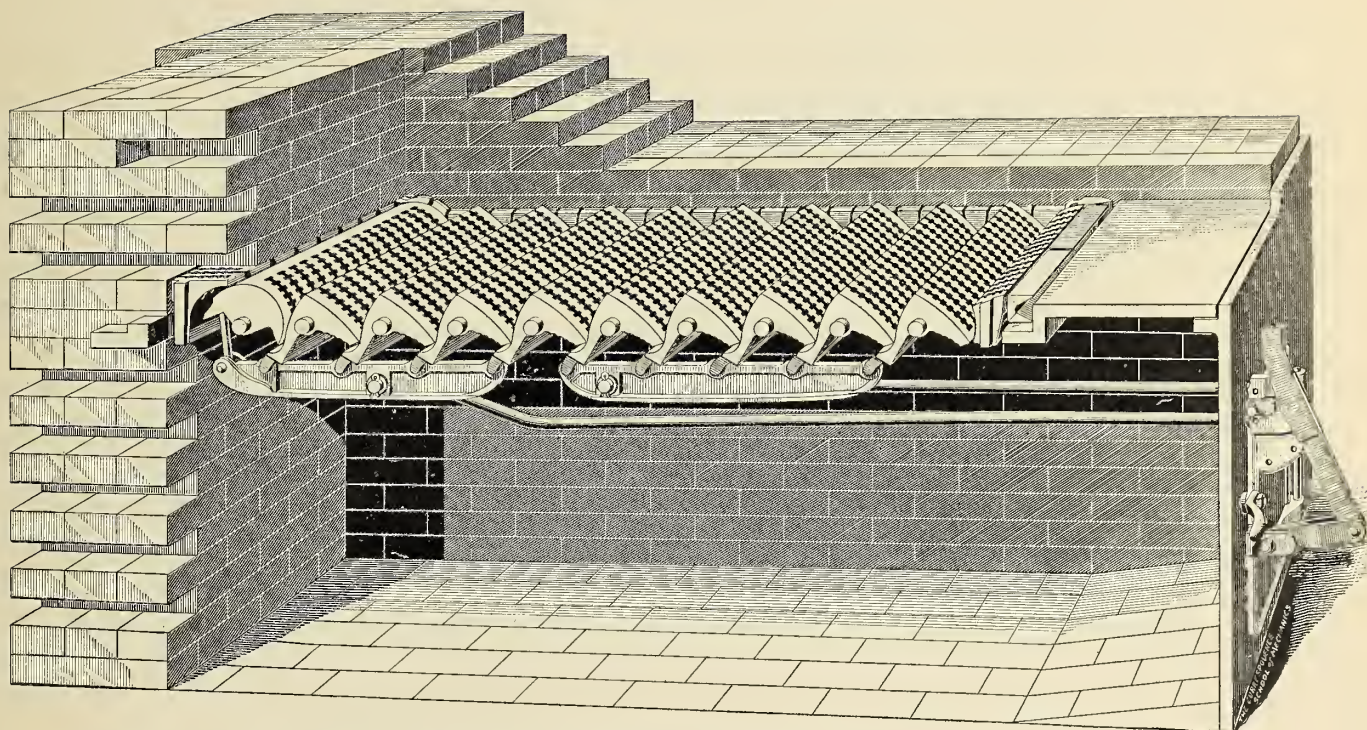
For explanation and description of journal caps, key plugs, crescent bar keepers and special front bearers, see Plate 7.

For description of right and left-hand and center pull grate bars, see Plates 22 and 23.

Large grates are made up in width by putting several rows together, and as we have patterns to make rows of different widths, also journal bars of different lengths, we can make a grate of almost any size. The above schedule of pieces will enable any person to send for repairs without liability of mistake. In ordering grate bars for repairs, always give the length of the bar on-top (not including the journals), and state whether the lower connecting bar journals are on the right-hand end, left-hand end, or center of the bar, as you stand looking into the furnace; also state whether you want crescent bars, heel bars, or regular grate bars, *i. e.*, designate them by their letter.

In ordering journal bars give length of line B B, Fig. 6, Plate 7.

PLATE NO. 2.



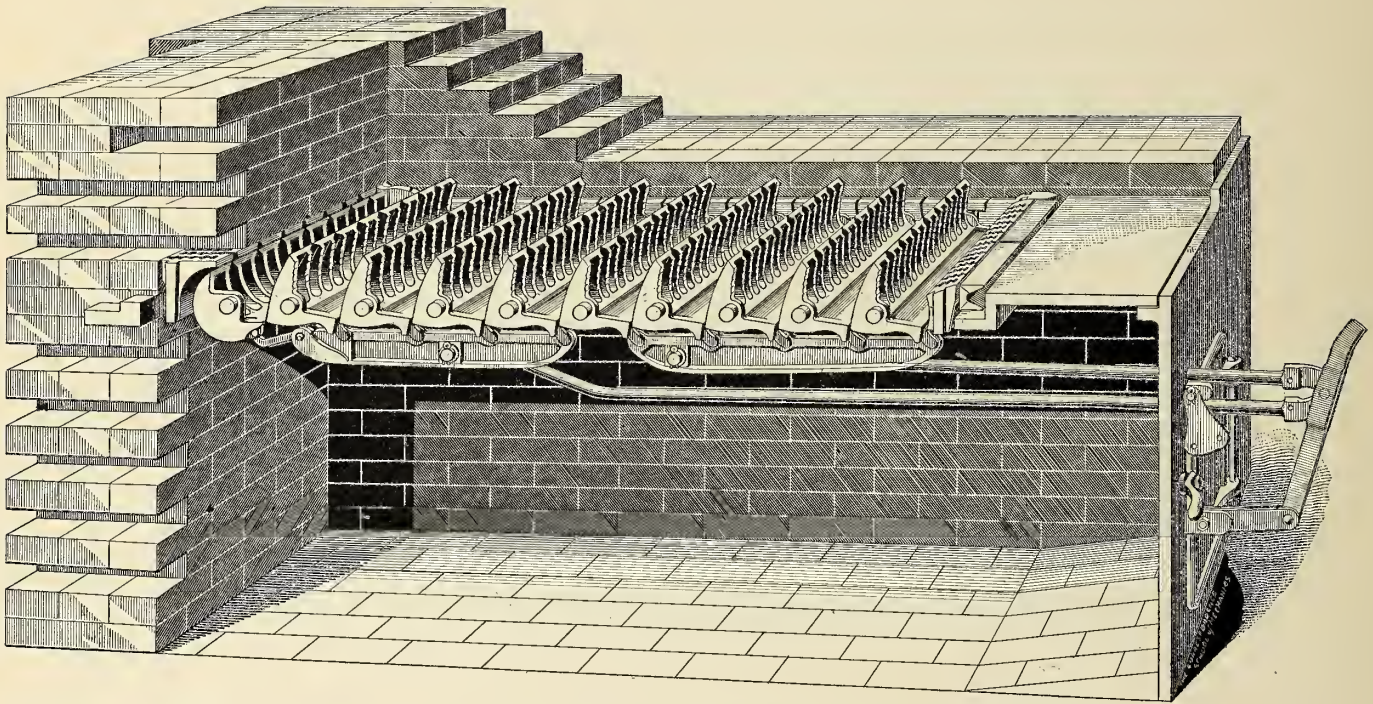
ONE DIVIDED SECTION OF McCLAVE'S IMPROVED GRATE, SHOWING SHAKING MOVEMENT.

This movement is used principally for soft coal and anthracite egg coal. In this movement there is no increase of openings during the operation, the bars keeping equidistant from each other in their travel from the normal position downward and return. To operate, place the operating handle on both stub levers, and move them inward until the shoulders of the connecting rods strike the front; then return to the stopping place when latched. Repeat the movement as often as necessary, always latching the stub levers at the finish, as this indicates when the grate bars are level.

The tendency of soft coal is to cake and it therefore needs to be broken up very often. To do this without opening the fire doors (thereby preventing a large volume of air from rushing in over the fire), has been a long felt want, which is, in a great measure, supplied by this movement. An anthracite egg coal fire also needs to be shaken when there is an accumulation of ash through the mass.

When there are clinkers to be removed, use either of the cut-off movements as may serve best, as shown on Plates 3, 4 and 5.

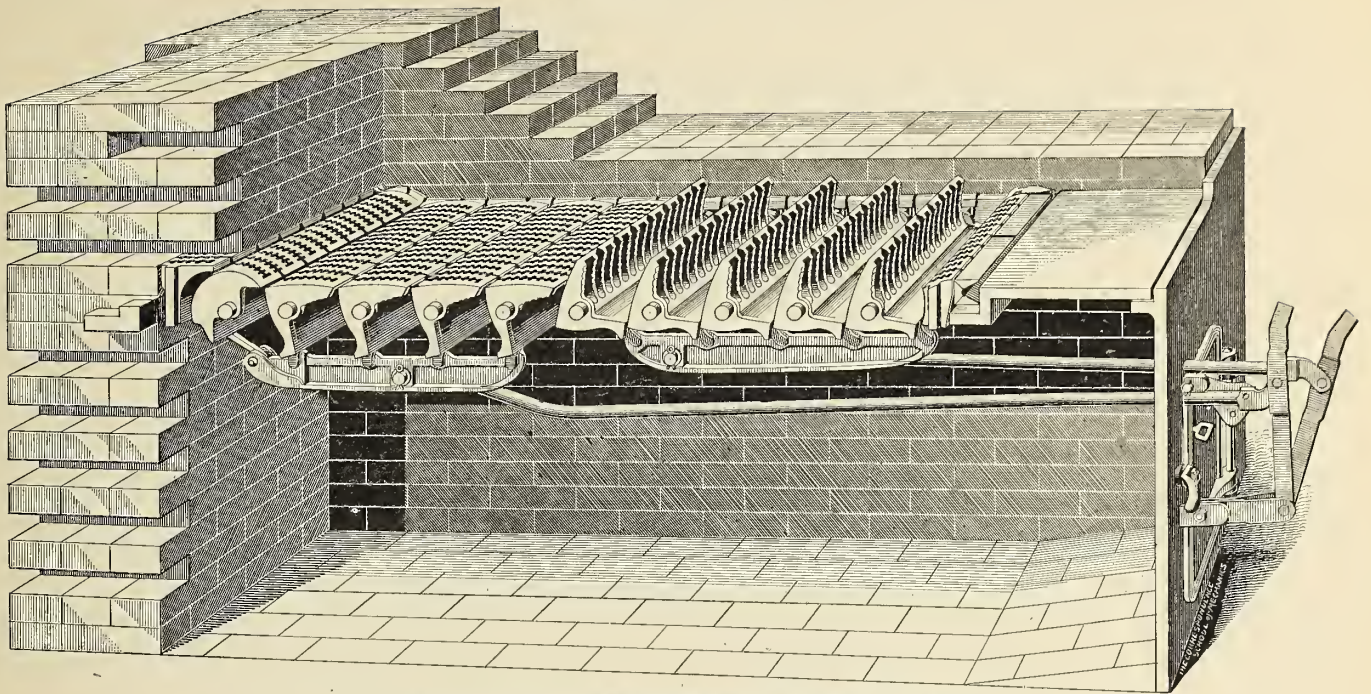
PLATE NO. 3.



SHOWING CUT-OFF MOVEMENT AS AN ENTIRE ROW OR SECTION.

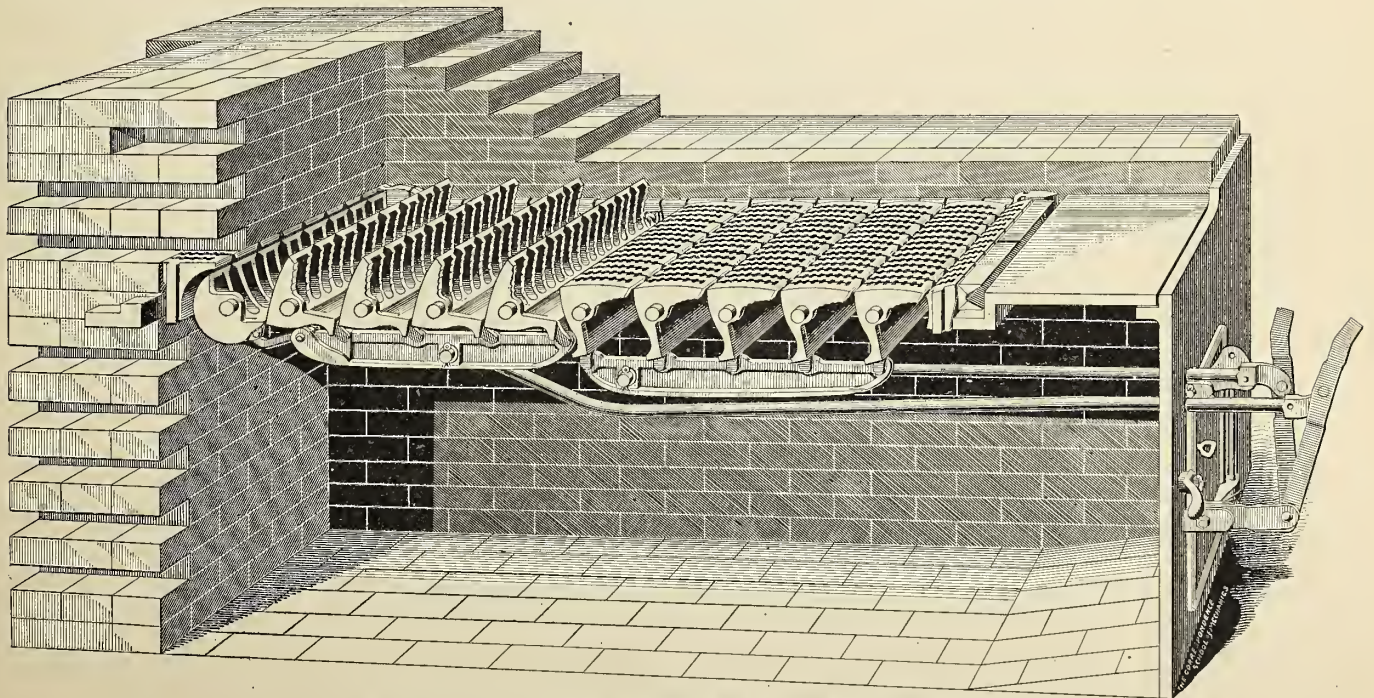
This movement is used principally for fine anthracite fuel, such as culm, birdseye, buckwheat and pea. It is a well-known fact that small anthracite fuels should not be shaken or stirred up in any manner until it becomes necessary to give the fire a thorough cleaning. It should then be cleaned as quickly as possible, in order to prevent the steam from running down. For all free burning varieties of coal that do not produce large slabs of clinkers, this movement mows the clinkers and ashes from the bottom of the fire quickly and thoroughly without opening a fire door and without waste of fuel. Especially is this true when the Argand Steam Blower is used to furnish blast, as the steam serves to keep the clinkers soft, and therefore easily crush through into the ash-pit. When a fan blast or a strong chimney draft is used the clinkers are generally larger and harder, and therefore, more difficult to cut down. For some varieties of fine anthracite which form large soft clinkers, a partial movement in both directions (i. e., of shaking and cut-off movement), will work advantageously. In this case the lever should be vibrated quickly back and forth, about half way in on the shaking movement, and half way out on the cut-off movement. This action will cut away the clinkers and ashes a little at a time and lessen the liability of breaking up the surface of the fire during the process of cleaning.

PLATE NO. 4.



DIVIDED CUT-OFF MOVEMENT, FRONT SERIES.

PLATE NO. 5.

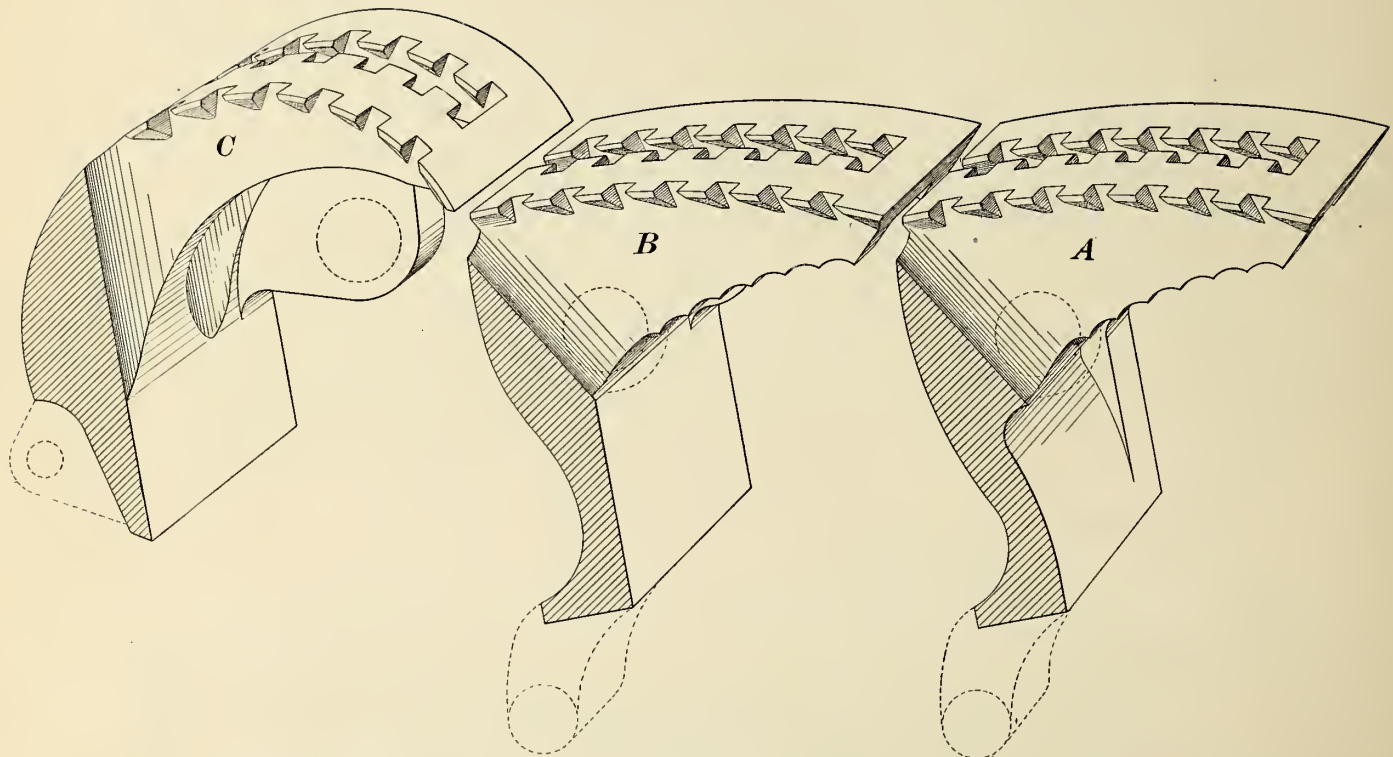


DIVIDED CUT-OFF MOVEMENT, REAR SERIES.

This method of operation is especially designed for all kinds of coal fuels which form large slabs of clinkers, and which cannot be properly handled by either of the other movements without wasting the unconsumed fuel on the surface of the fire.

To operate, first push the unconsumed fuel on all the front series of grate bars back on to the rear series of grate bars; then arrange all the latches to hold the back series in place; then place the operating handle on the stub lever that operates the front series of grate bars; then pull the lever forward to full extent of movement and return. Repeat until the ashes and clinkers on the front series are completely cut through into the ash-pit, and when the entire grate consists of several rows do the same with all of them. After the entire front half of the grate is dumped, then adjust all the latches to hold the front series in place; then pull the unconsumed fuel forward onto the front half and cut down the rear half in the same manner as described for the front half. Then adjust all the latches so as to hold both series in normal position, after which redistribute the unconsumed coal over the entire grate.

PLATE NO. 6.



C, Crescent Grate Bar.

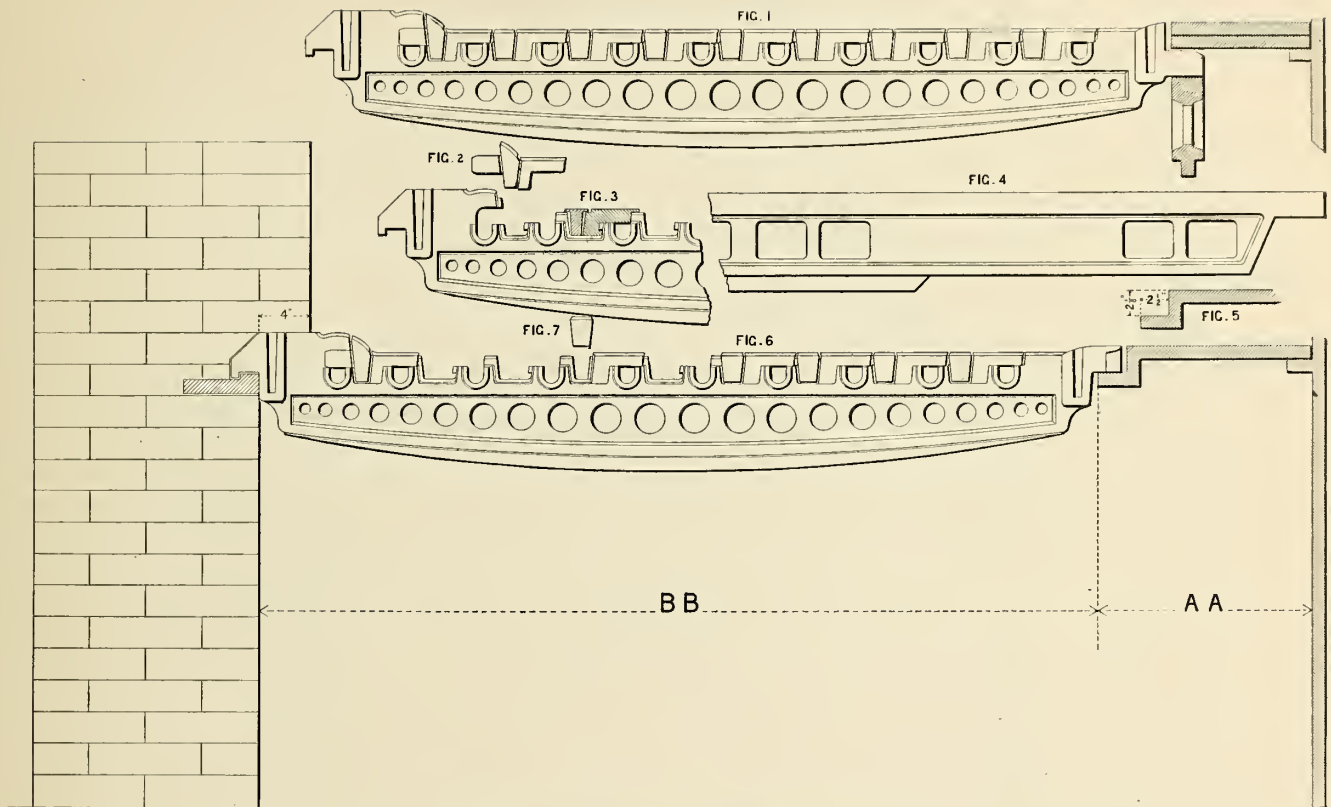
B, Heel Grate Bar.

A, Regular Grate Bar.

PERSPECTIVE SECTION OF EACH OF THE THREE DIFFERENT KINDS OF GRATE BARS.

The grate bars of each row or section consist of one crescent bar, one heel bar and as many regular grate bars as are necessary to fill up the row. The heel grate bar goes next to the crescent bar and differs from the regular bar in having a greater concavity in the back to receive the nose of the crescent bar in the shaking movement. In ordering grate bars for repairs, give the length on top, not including journals in the measurement; also state whether the bars required are crescent, heel or regular grate bars, and whether the lower journal, *i. e.*, connecting bar journal, is on the right or left-hand or in center of the grate bar. (See Plates 22 and 23.)

PLATE NO. 7.



JOURNAL BEARING BARS.

Fig. 1 shows a journal bearing bar with the nib at front end set down so that it will go under the dead plate; also sectional view of a special front bearer under the nib. This bearer is generally used for boilers where there is no rabbet on the dead plate.

Fig. 2 shows crescent bar keeper, rear key plug and heel bar cap. Excepting these three pieces, all the rest of the caps and key plugs on the journal bearing bar are interchangeable.

Fig. 3 is a broken view showing the rear part of journal bearing bar where the keeper, rear key plug and heel bar cap are to be placed, and also showing longitudinal section of the regular caps and key plugs in place.

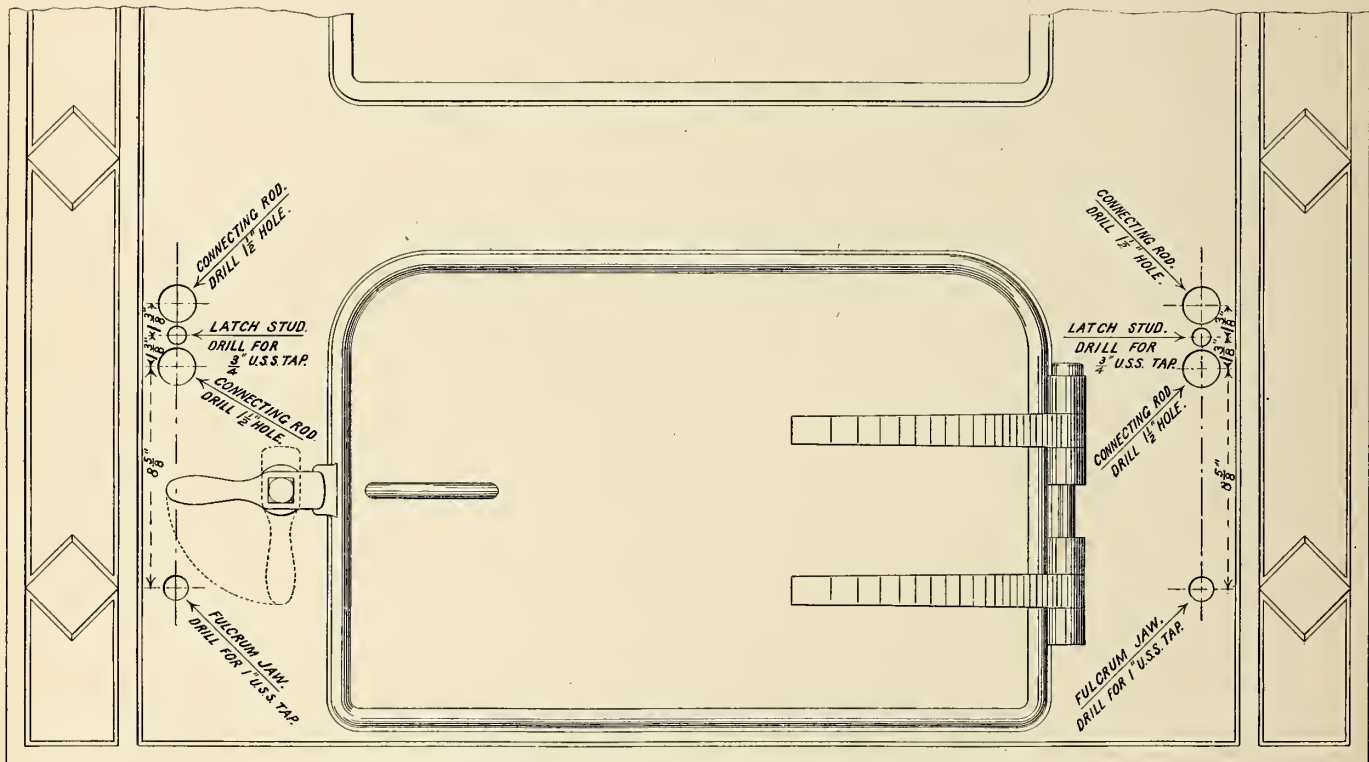
Fig. 4 is a broken view of special front bearer showing holes through the panel for connecting rods to pass through.

Fig. 5 gives the dimensions for rabbet on dead plate to suit front end of grate, viz.: $2\frac{1}{2}$ inches projection by $2\frac{3}{8}$ inches deep.

Fig. 6 shows journal bearing bar in place, with front end resting on rabbet on dead plate, and rear end resting on regular back bearer; also manner of building bridge wall above the grate line, viz.: stepping it forward 4 inches on top of the back frame ends so as to cover same.

This construction of the bridge wall avoids an uncleaned part along the face of the bridge wall, as the crescent bars revolve under the projection, thereby forming pockets flush with the face of the bridge wall.

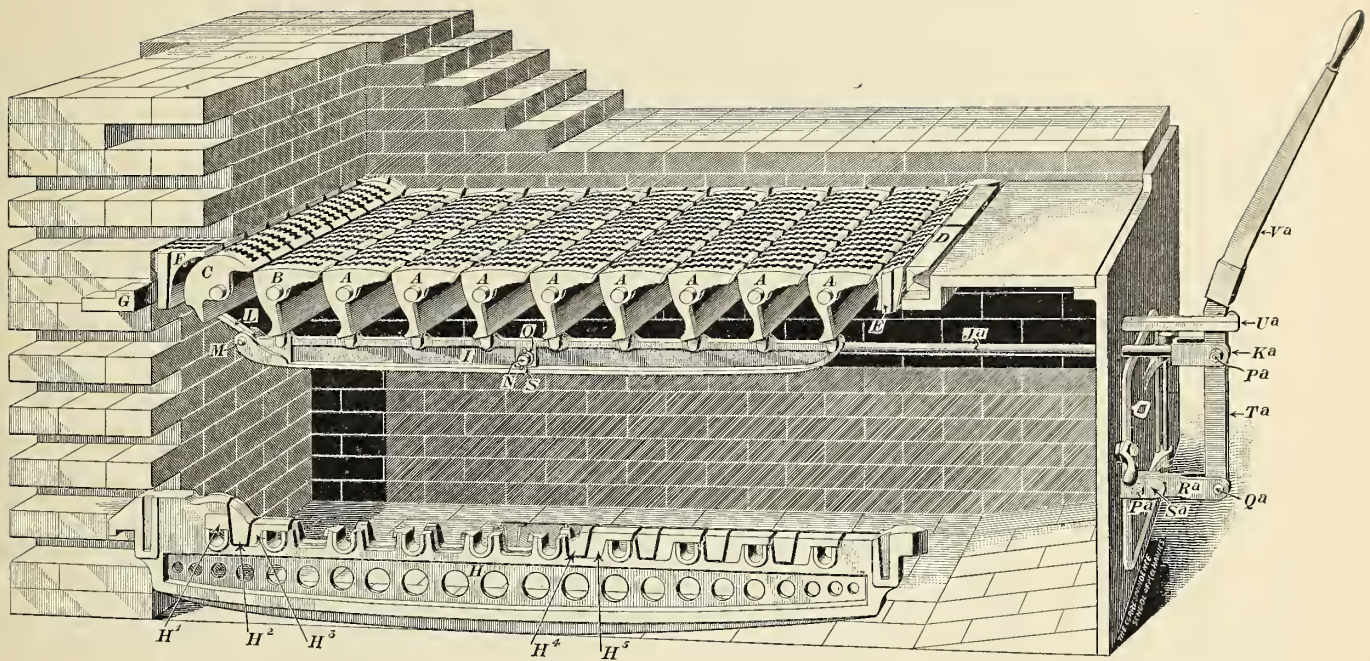
PLATE NO. 8.



Showing the size of holes through the front and their relation to each other for the **Twin Lever Construction**. When the steel eyelets are not used, the holes for connecting rods should be drilled $1\frac{1}{8}$ " instead of $1\frac{1}{2}$ ". When the fronts are $\frac{3}{4}$ " and upward in thickness, the eyelets will be unnecessary, as they are designed for thin fronts only, to prevent the holes from increasing in size too rapidly by the friction of the connecting rods. Otherwise the size and relation of holes to each other should be respected whether the levers are placed vertically or horizontally on the front.

NOTE.—It is important that the holes should be drilled straight through the front, and that the stud holes are not tapped too large, as the studs should screw in tight and project straight out from the front.

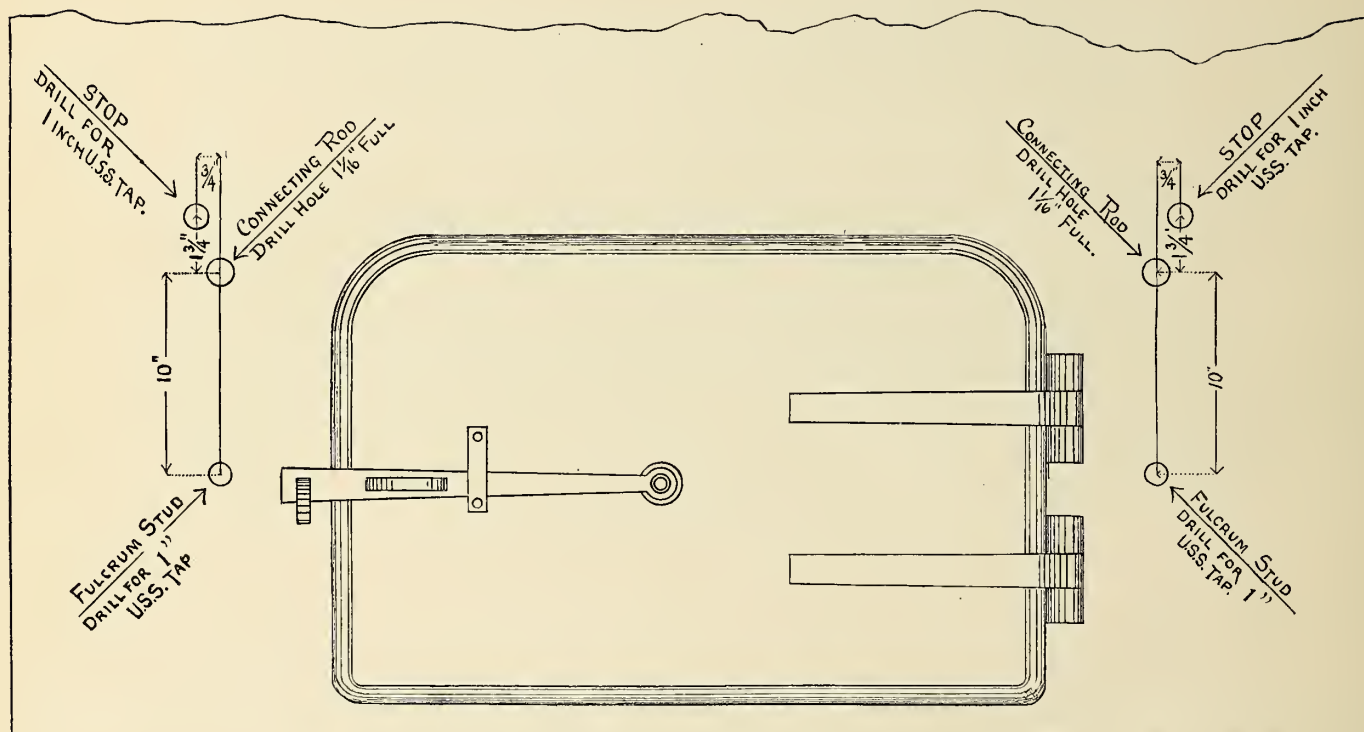
PLATE NO. 9.



One section of McClave's Improved Grate **Fitted with Single Levers for Whole Cut-Off Movement**, with the grate bars in their normal position, and having one journal bar removed. All the pieces in this section are designated by letters, and are named and described as follows:

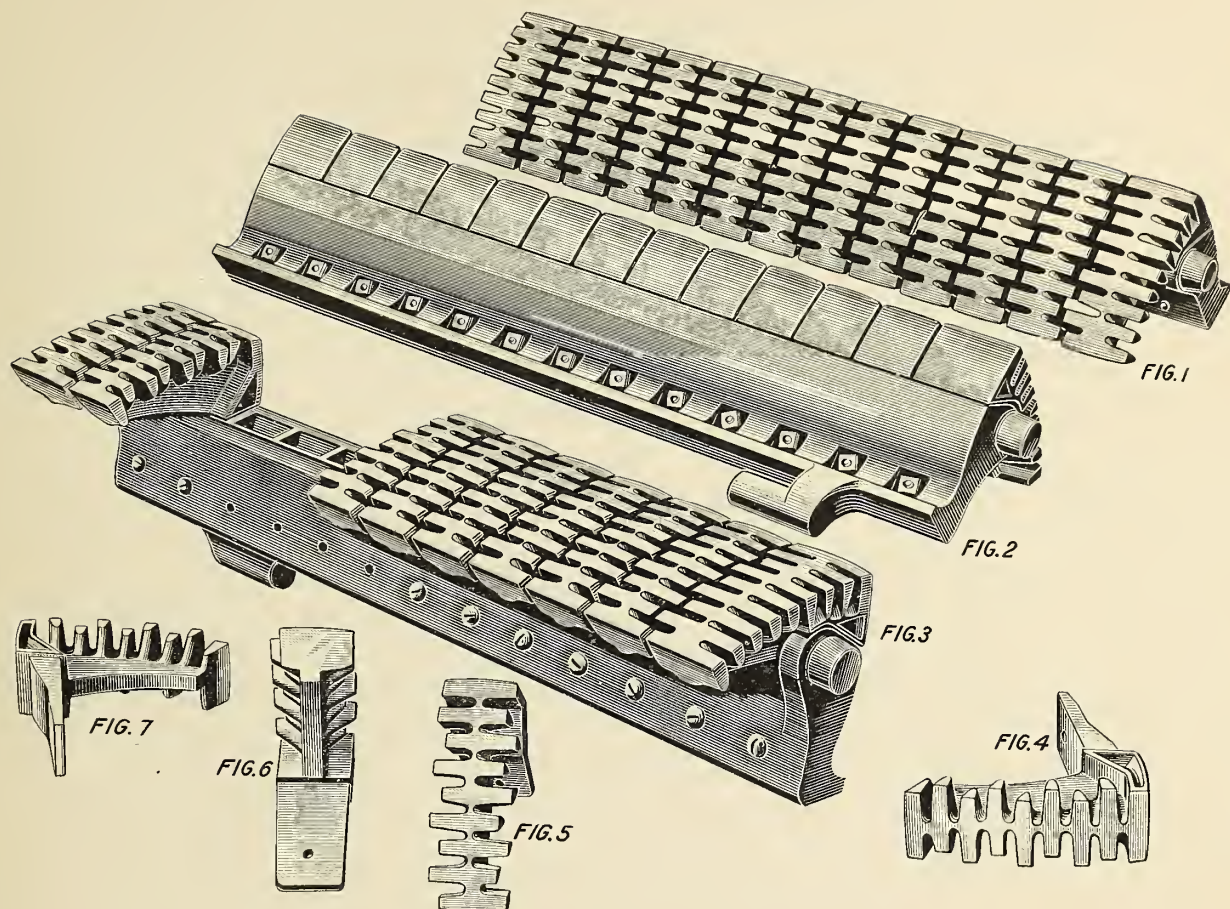
- | | |
|---|---|
| A, Regular grate bars. | Ja, Connecting rod. |
| B, Heel grate bar. | Ka, Connecting rod jaw. |
| C, Crescent grate bar. | L, Working bar extension. |
| D, Front liner. | M, Bolt for extension. |
| E, Front frame end. | N, Eye bolt. |
| F, Back frame end. | O, Washer for eye bolt. |
| G, Back bearer. | Pa, $2\frac{1}{2}$ " x $\frac{5}{8}$ " bolts. |
| H, Journal bearing bar. | Qa, Stub lever rivet. |
| H ¹ , Crescent bar keeper. | Ra, Fulcrum straps. |
| H ² , Rear key plug. | Sa, Fulcrum stud or jaw. |
| H ³ , Heel bar cap. | Ta, Stub lever. |
| H ⁴ , Regular key plug. | Ua, Stop. |
| H ⁵ , Regular grate bar cap. | Va, Socket Handle. |
| I, Working bar. | |

PLATE NO. 10.



Showing the size of holes through the front and their relation to each other for the **Single Lever Connections**. When the levers are placed horizontally on the front between the fire and ash doors, the ends of the levers should be bent upwards about $1\frac{3}{4}$ inches, so that when the operating handle is placed on one lever it will not strike the other when being operated. If the space between the fire and ash doors is contracted, the bend of the lever can commence one inch from the center of bolt hole for jaw of connecting rod; in such cases, the stops should be placed only $\frac{3}{8}$ -inch below the line of the other two holes, instead of $\frac{3}{4}$ -inch, as shown above, but when the bend commences just outside the stop, then the stop should be $\frac{3}{4}$ -inch below, measuring in all cases from a line through the center of the other two holes to find the center of hole for stop.

PLATE NO. 11.



McClave's Perfect Grate.

PATENTED MAY 19, 1885, NOVEMBER 13, 1894, AND JULY 12, 1898.

This grate is constructed on the same general lines as McClave's Improved Grate, described on page 4, and differs from it only in the construction of the Regular and Heel Grate Bars as shown above, the levers, connecting rods, and method of applying them to this grate being just the same as for McClave's Improved Grate.

The important feature in this form of construction is, that the fingers or top portion of the grate bars are cast separately, and the body portion of the bars made with sockets to receive the shanks of the fingers, whereby a very strong construction is obtained, and the cost of repairs reduced to a minimum, as in case a finger should be broken, simply one finger would have to be replaced instead of a whole new bar.

The socketed portion or bar proper being $2\frac{1}{4}$ inches below the bottom of the fire, it will be comparatively cool all the time, and therefore cannot warp or burn out.

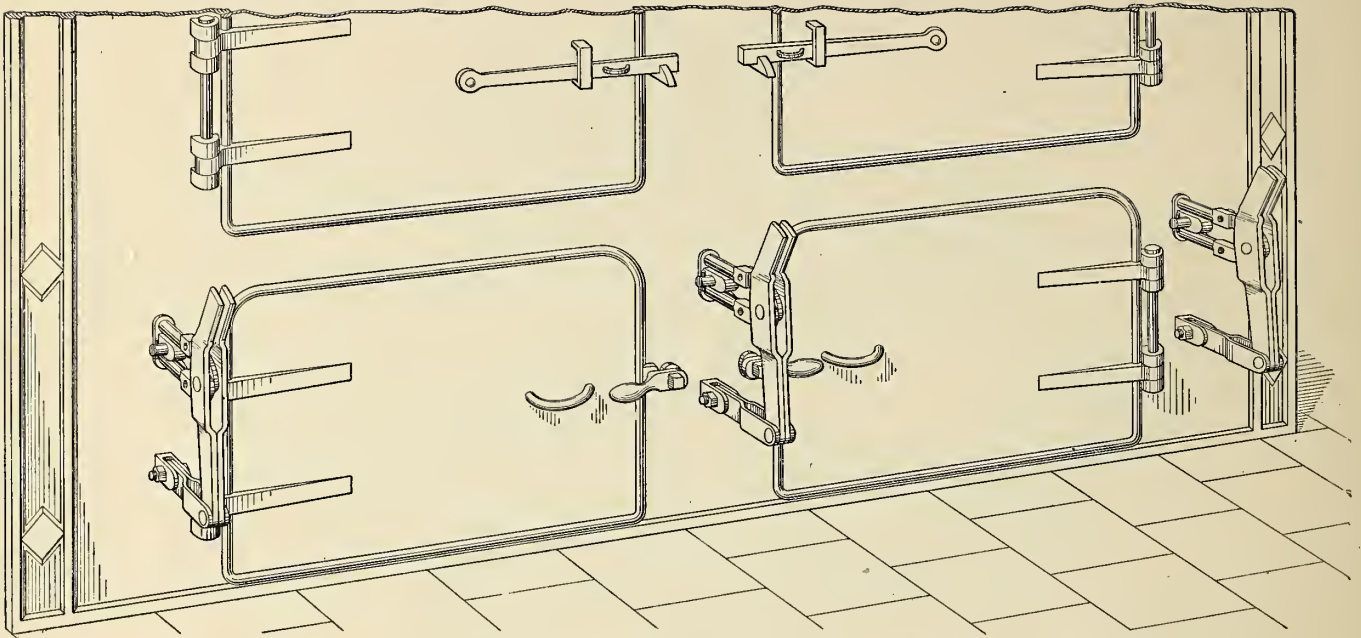
Fig. 1—Top view of grate bar fingers.

Fig. 2—Back view of grate bar and fingers.

Fig. 3—Front view of grate bar with some of the fingers removed, showing the sockets which receive the shanks of the fingers, also small bolts to hold the fingers rigid.

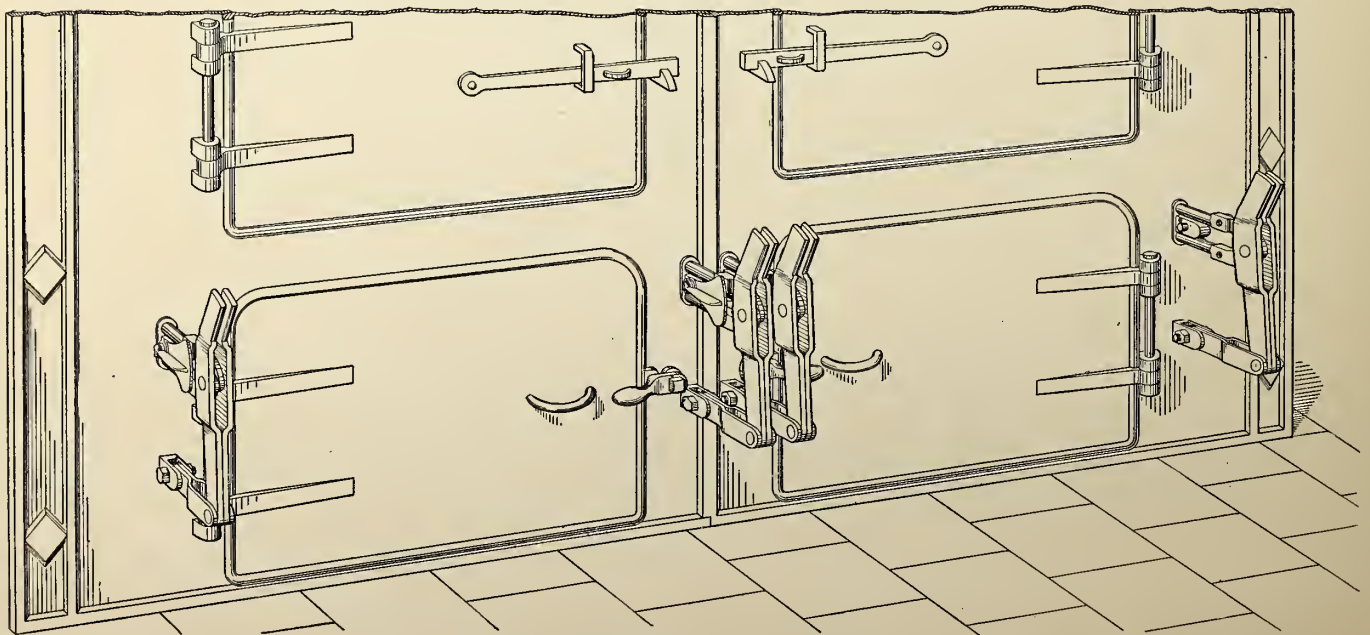
Figs. 4 to 7—Different views showing construction of fingers.

PLATE NO. 12.



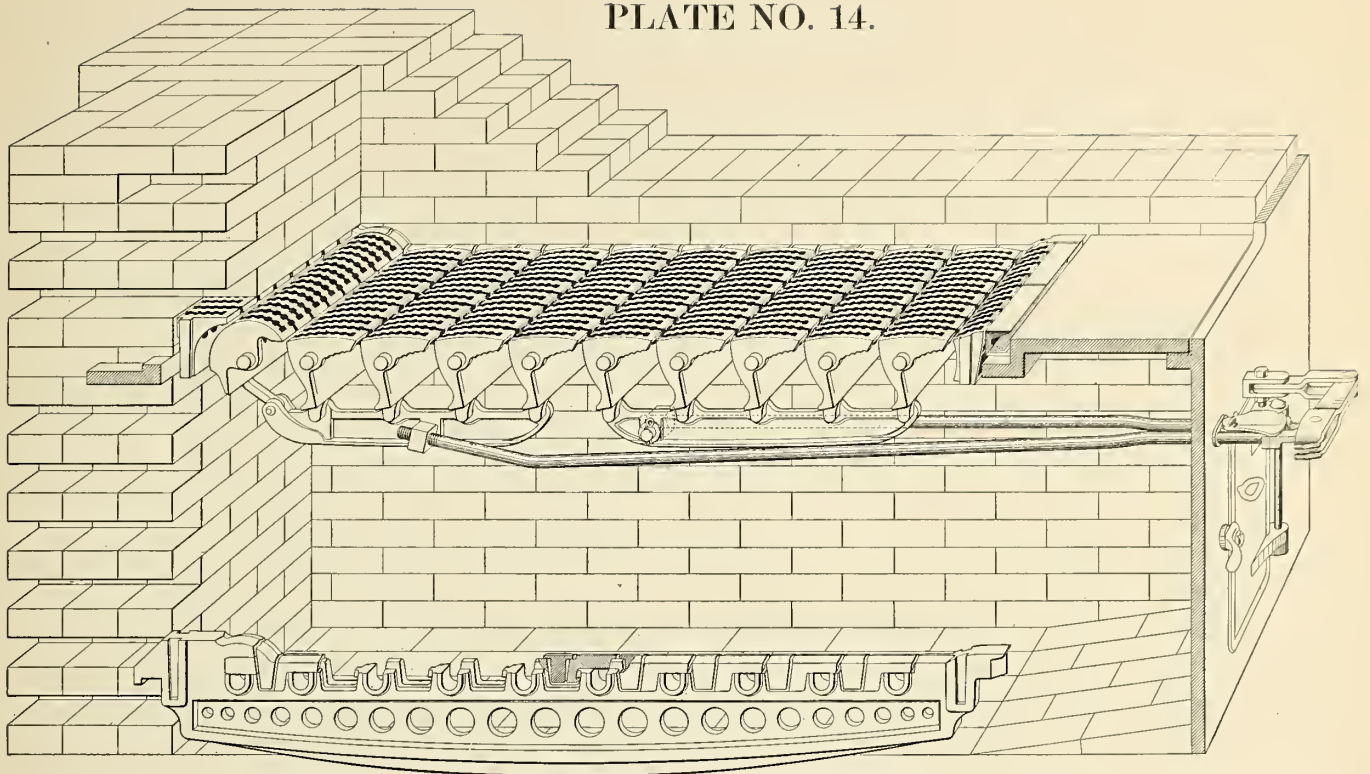
Method of Arranging the Twin Levers Vertically on the Front for a Grate consisting of Three Rows of Grate Bars. When the levers are placed as above shown, the center row of grate bars have the connecting bar journals at their centers, while the outside rows of grate bars are right and left-hand respectively.

PLATE NO. 13.



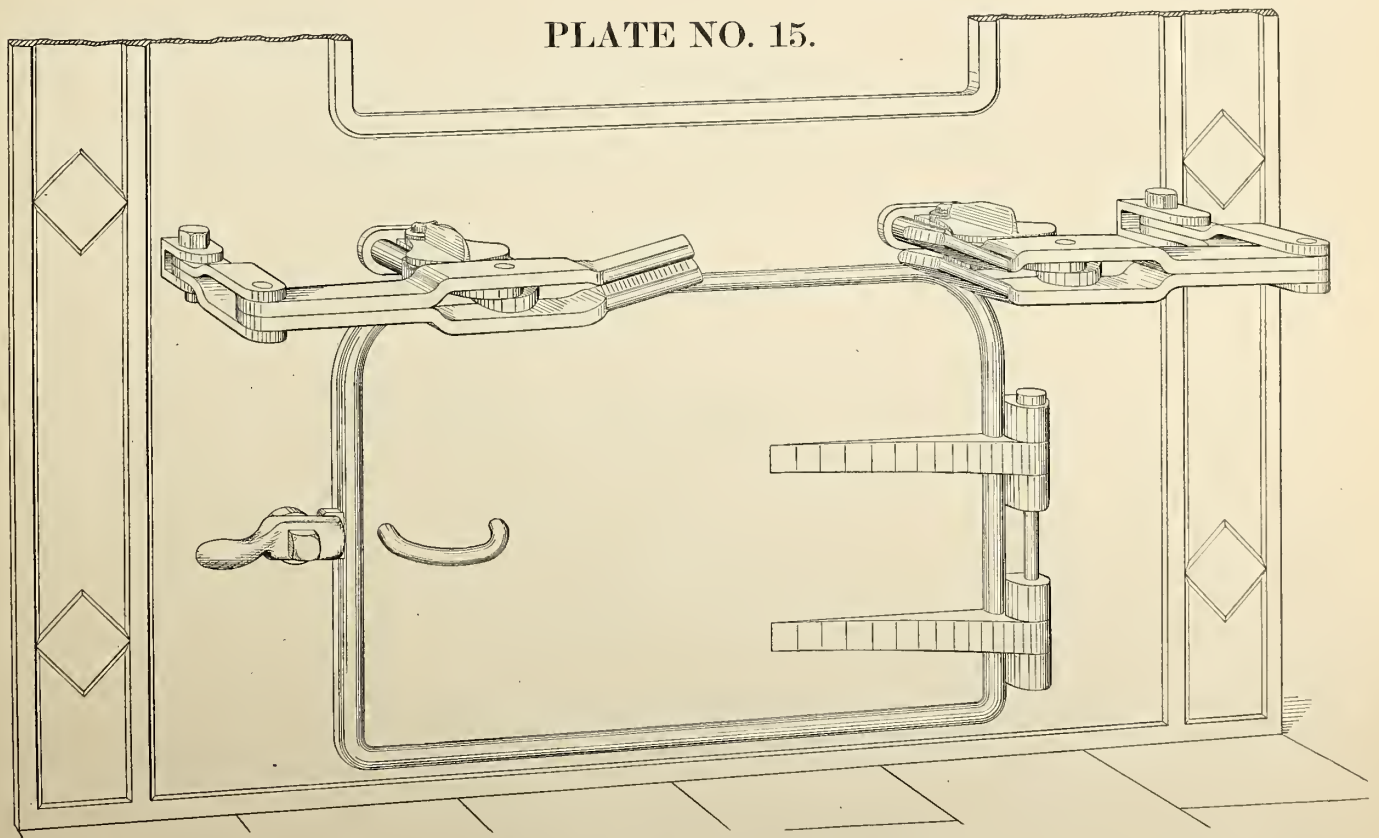
Method of Arranging the Levers Vertically on the Front for a Grate consisting of Four Rows of Grate Bars. In this arrangement all the grate bars are right and left-hand respectively.

PLATE NO. 14.



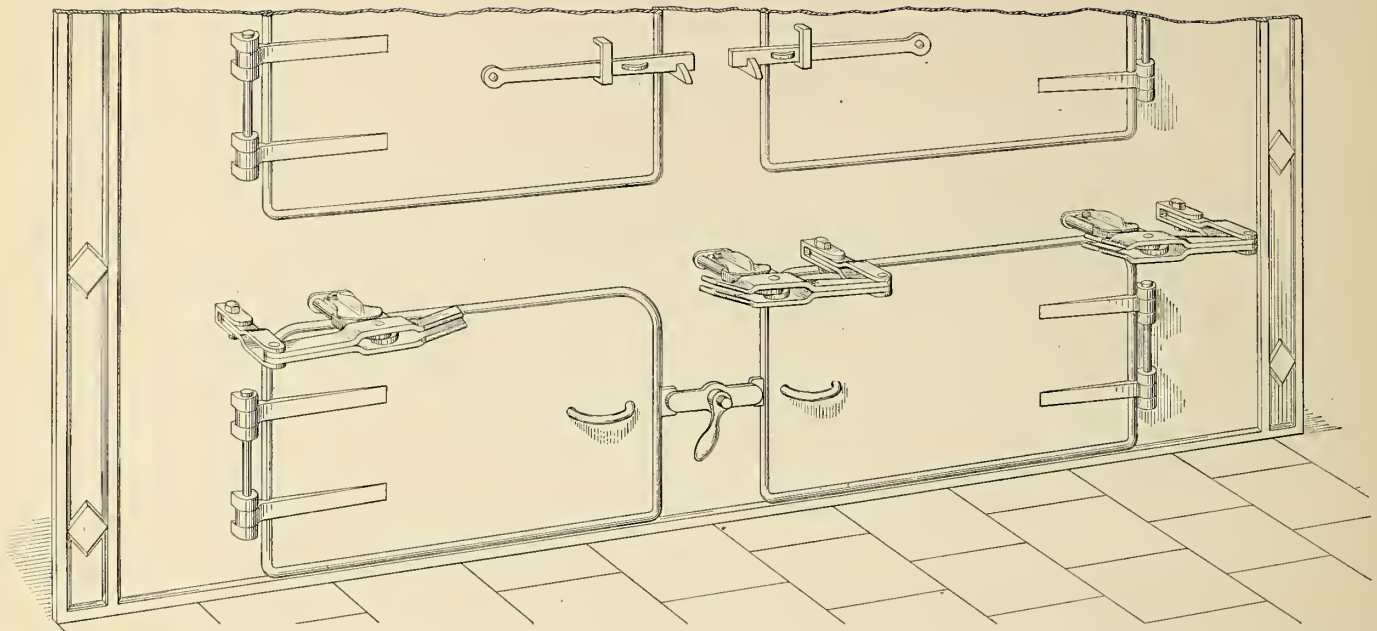
Method of Placing Levers Horizontally on the Front, showing the necessary bends in the rods to allow the connecting rods to pass on either side of the connecting bars, and to afford clearance below the eye bolt of the forward series, when the connecting rod of the rear series oscillates upward during separate operation of rear series.

PLATE NO. 15.



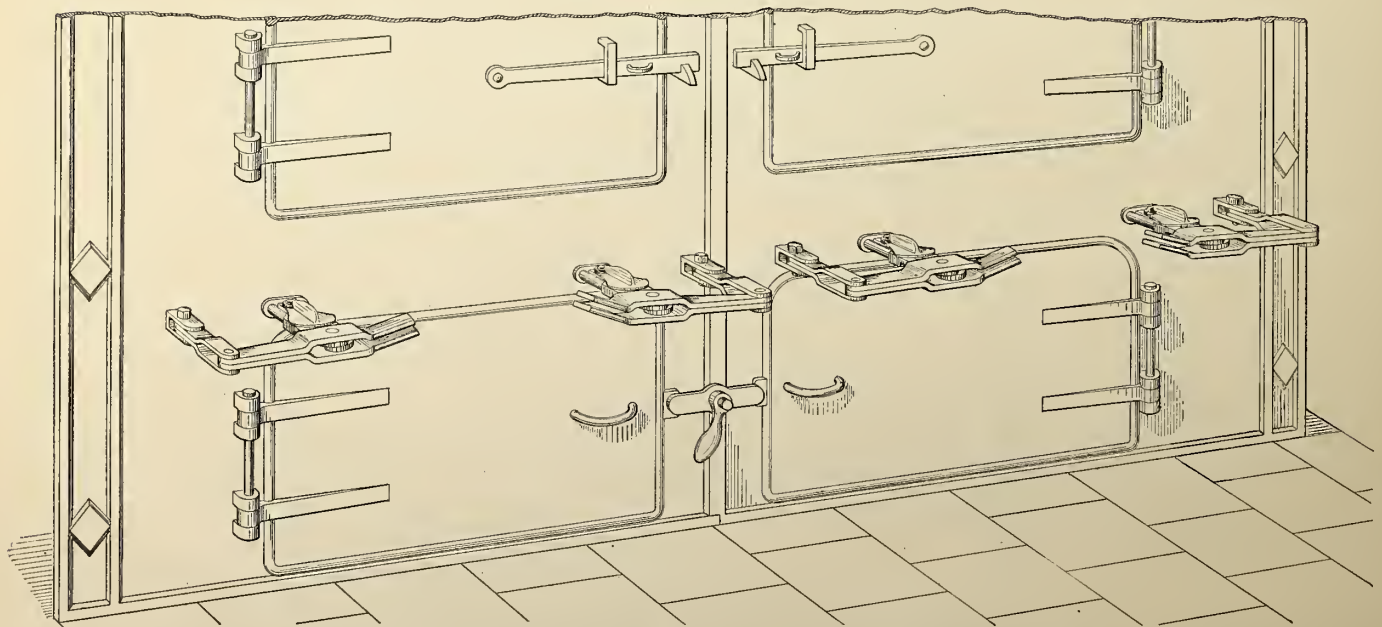
Method of Placing the Levers Horizontally on the Front when the Grate consists of Two Rows of Grate Bars. In this arrangement the grate bars may be right and left-handed or all of them center pull. The above view shows center pull.

PLATE NO. 16.



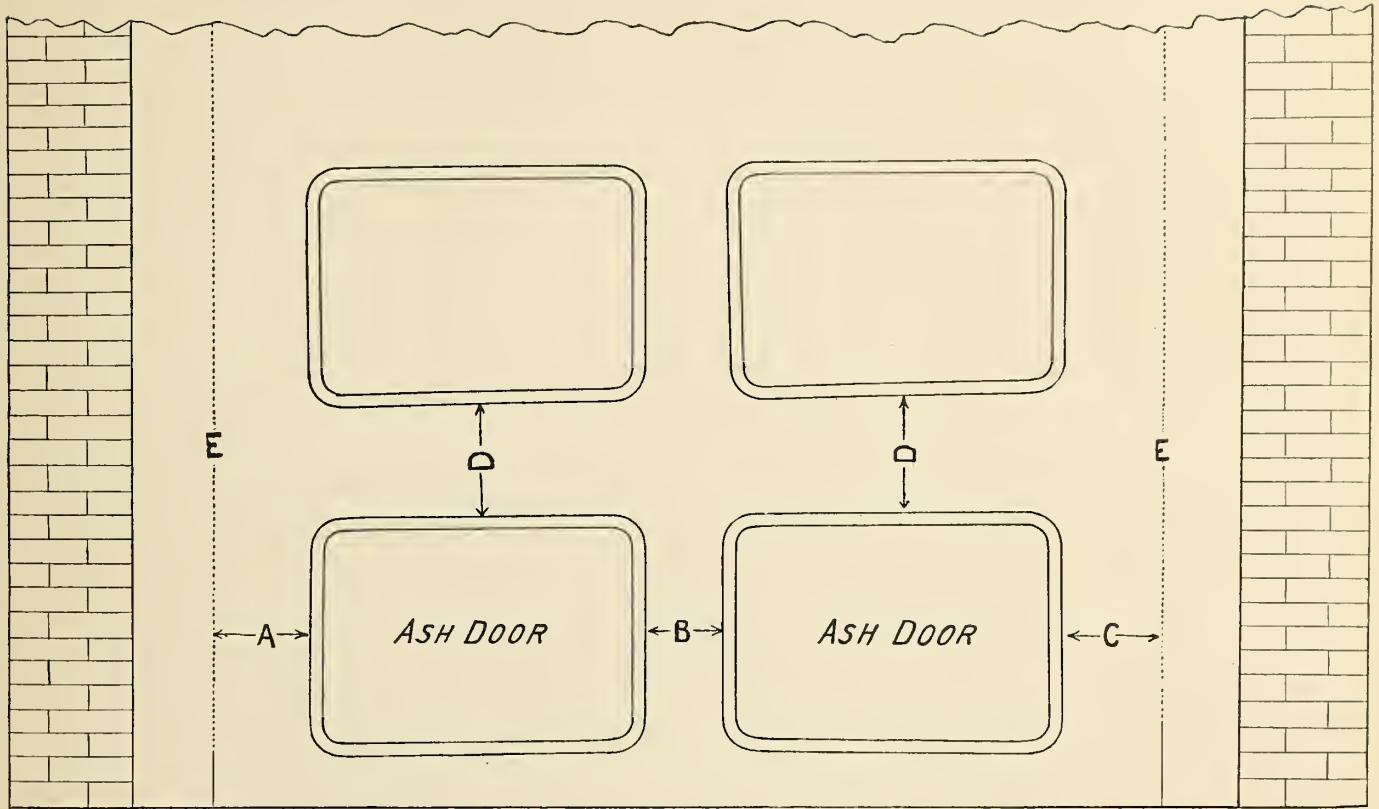
Method of Placing the Levers Horizontally on the Front, when the Grate consists of Three Rows of Grate Bars. In this arrangement the central row of grate bars is always central pull, while the outside rows may be either central pull, or right and left-hand respectively.

PLATE NO. 17.



Method of Placing the Levers Horizontally on the Front, when the Grate consists of Four Rows of Grate Bars. In this arrangement the two center rows are center pull, while the outside rows may be either center pull, or right and left-hand pull respectively. The above view is arranged for center pull grate bars.

PLATE NO. 18.



SECTION OF BOILER FRONT, SHOWING POINTS BETWEEN WHICH TO TAKE MEASUREMENTS

In order that we may know how to construct the grate so that the stub levers may be placed on the front to the best advantage.

Line A is space between inner face of left side wall and ash door.

Line B is space between ash-doors.

Line C is space between ash-doors and inner face of right side wall as you stand facing the front.

Line D is space between ash and fire doors.

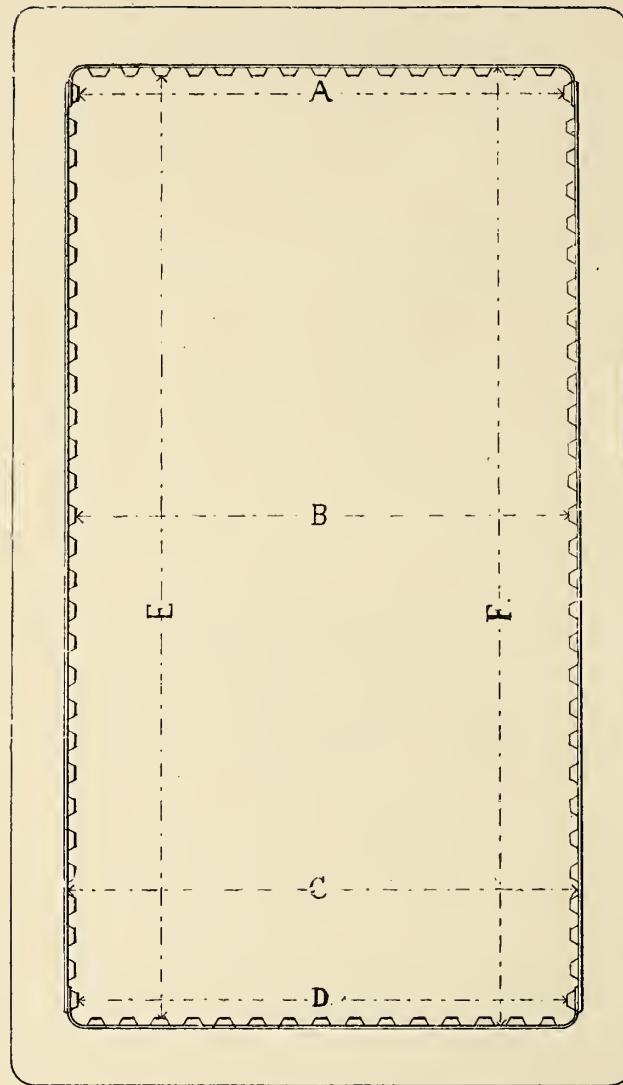
Line E represents inner faces of side walls.

NOTE.—In taking lines A and C do not measure from the brick corner jams to ash-doors, but from the true face lines of side walls. In sending above dimensions it will be unnecessary to make a sketch, but simply state the number of the plate, then what line A measures, and what line B measures, etc.

Where there is only one ash-door, give lines A and C. Where there are more than two ash-doors, the line B will give distance between each of them, as they are nearly always equi-distant from each other.

PLATE NO. 19.

BACK



FRONT

PLAN OF BOILER LEG FOR THE LOCOMOTIVE TYPE,

Showing the points between which to measure for a grate in order to insure a good fit.

Line A is between rivet heads at back end where the plates are lapped, and should be taken as high up in the leg as it may be desired to have the top surface of the grate (which is usually about 6 inches).

Line B is between rivet heads at bottom of leg.

Line C is between plates, taken on line with top surface of grate.

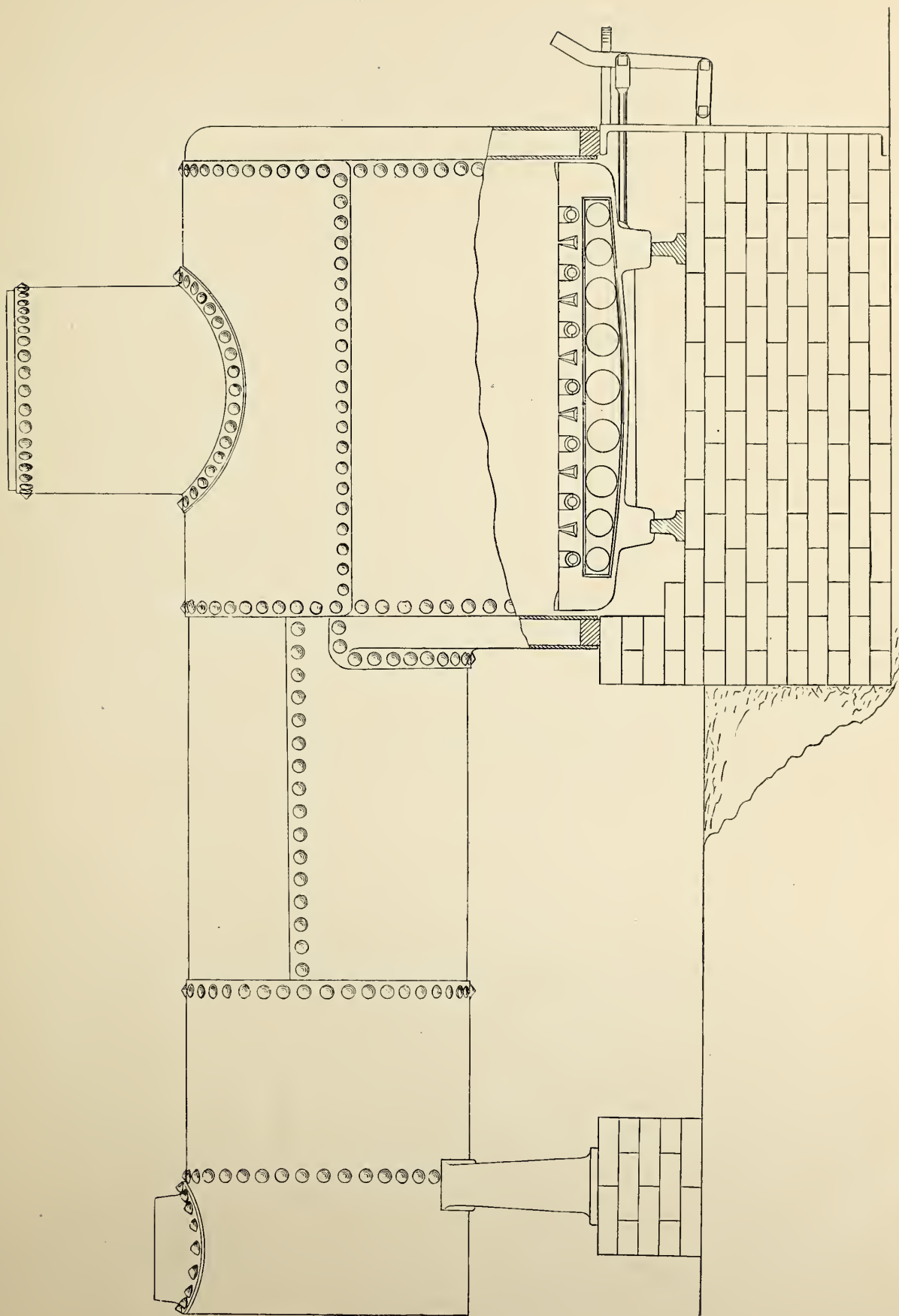
Line D is between rivet heads at front end of leg where the plates are lapped and on line with top surface of grate.

Line E is between rivet heads at bottom of leg.

Line F is between plates on line with top surface of grate.

In ordering it will not be necessary to make a sketch, but simply state the length of line A, line B, etc.

PLATE NO. 20.



Method of Application to the Locomotive Type of Boiler, showing Single Lever connection. The connecting rods in this case pass over the top of the front bearer.

Important.

WE desire to call especial attention of all parties who are using, or who contemplate using our Grates and Blowers, to the importance of having deep ash-pits, as many of the boiler settings of the present day are so cut down in order to save a few bricks and a few pounds of metal in the front, that there is scarcely room enough below the grate to call it an ash-pit. This is poor economy, no matter what kind of a grate is used; but especially is this true where a grate is used that will cut away the clinkers and ashes from the under side of the fire and drop them into the ash-pit. The ash-pit for a boiler furnace where our grate is used, should be deep enough to receive at least two cleanings of the fire without filling it more than one-third full, for when there is a strong fire on top of the grate, and red-hot clinkers and ashes nearly up to the bottom of it, there can be but one result, viz., the grate will sag down; or, if the hot clinkers and ashes touch the bottom of the grate, it will melt and be burned into a cinder, as it would then be in a focus between two fires. Grates under small boilers, such as generally used for steam heating purposes, do not require the same depth of ash-pit as do larger ones under boilers used for power. We, therefore, subjoin a schedule of minimum depths for all ash-pits where our grates are used.

For grates (nearly square) up to 12 square feet, the distance from the top of the grate to the bottom of the ash-pit should be at least 30 inches. Where small grates are long and narrow, the ash-pit should be 33 inches deep from top of grate.

For grates from 12 to 24 square feet, 33 inches deep.

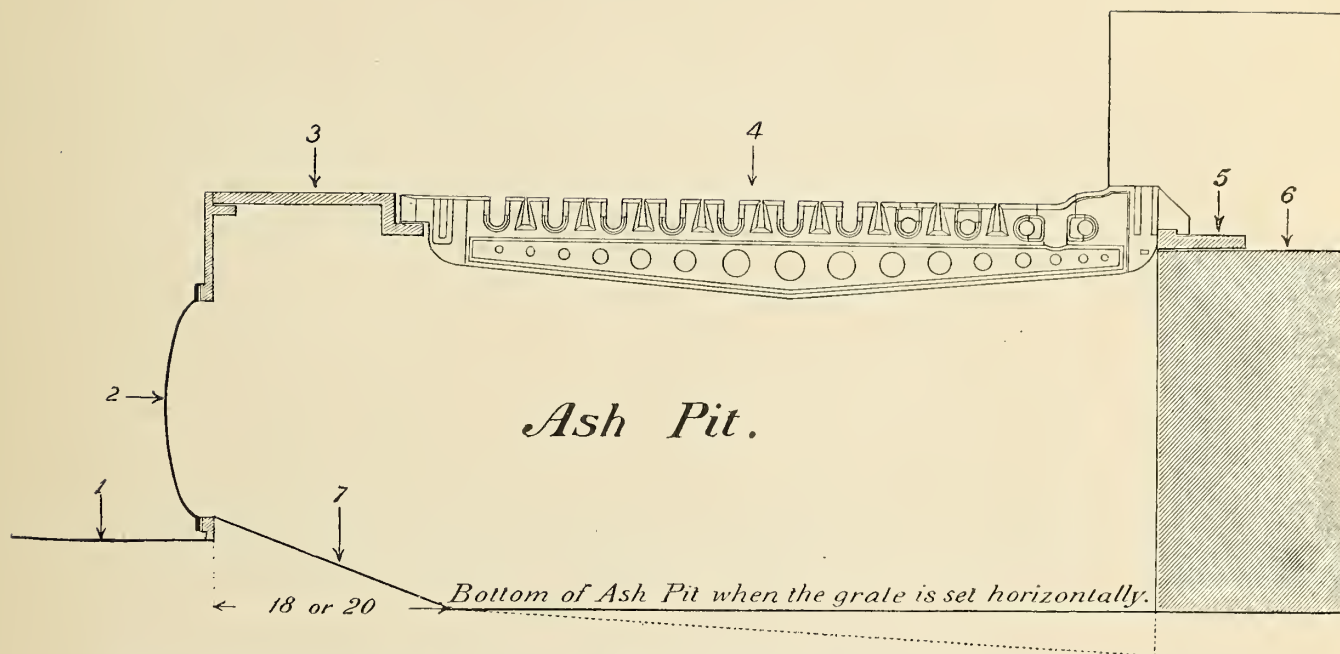
For grates from 24 to 36 square feet, 36 inches deep.

For grates from 36 to 72 square feet and upwards, 40 inches deep.

We do not wish to be understood that our grates cannot be used where the ash-pits are not so deep as named in the foregoing schedule, and if care is taken to always clean the ash-pit every time the fire is cleaned; but we give these depths as the minimum of what they should be in order to prevent the liability of hot clinkers and ashes getting up too near the grate. Our grates are constructed on scientific principles with regard to the prevention of warping or burning, and have been thoroughly tested during the past ten years, and accorded the highest testimonials by many of the best mechanical engineers in the country as to their durability, given strictly on their merits. A large majority of the grates we have put in have been in use for years without requiring any repairs, yet we have had several grates burned into a cinder in less than a week after they were put in, simply because the ash-pits were too shallow.

Where the boilers are already set and the ash-pits are too shallow, or when new fronts are so constructed that the pits will be shallow, they can be countersunk, battering from the bottom up to the ash-pit door sill, commencing the batter 18 or 20 inches from the front, as shown on Plate 21.

PLATE NO. 21.



**LONGITUDINAL SECTION OF BOILER FURNACE SHOWING METHOD OF DEEPENING ASH-PITS
WHERE THEY ARE TOO SHALLOW,**

With parts numbered as follows:

Fig. 1—Boiler room floor.

Fig. 2—Ash-pit door.

Fig. 3—Dead plate.

Fig. 4—Top surface of grate.

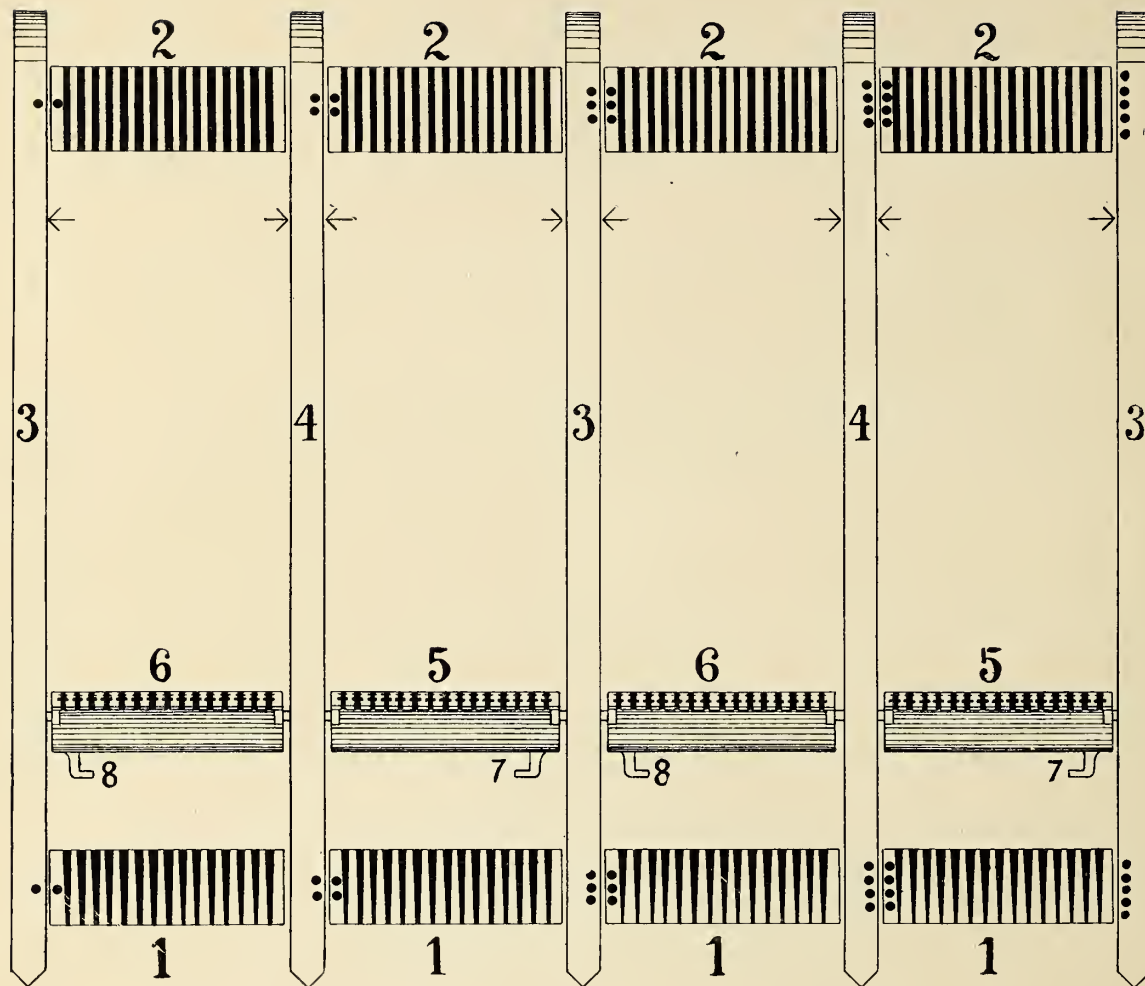
Fig. 5—Back bearing bar.

Fig. 6—Bridge wall at the height it should be built before the frame is put in place; after the frame is in, the wall should be finished as per outline above so as to cover the back frame end.

Fig. 7—Batter or slant of ash-pit bottom at front end.

When the back end of the grate is placed lower than the front end, the bottom of ash-pit should be lowered accordingly as shown by dotted line. (See description on preceding page.)

PLATE NO. 22.



Front End.

DIAGRAM OF GRATE FRAME FOR A GRATE OF FOUR ROWS OR SECTIONS,

And arranged to have a pair of connecting bar journals in the center of the construction and a separate connecting bar journal at each side of the same. We have printed diagrams of grate frames for grates of from one to six rows or sections, each put together in two different ways, which are not shown in this catalogue, but which will be mailed with shipments according to their class.

Fig. 1—Front frame ends.

Fig. 2—Back frame ends.

Figs. 3 and 4—Journal bearing bars.

Fig. 5—Right-hand regular grate bar thrown open to show connecting bar journals.

Fig. 6—Left-hand regular grate bar.

Figs. 7 and 8—Connecting bar journals.

The center punch marks show how the frame should be put together, as you stand in front of the boiler looking into the furnace.

PLATE NO. 23.

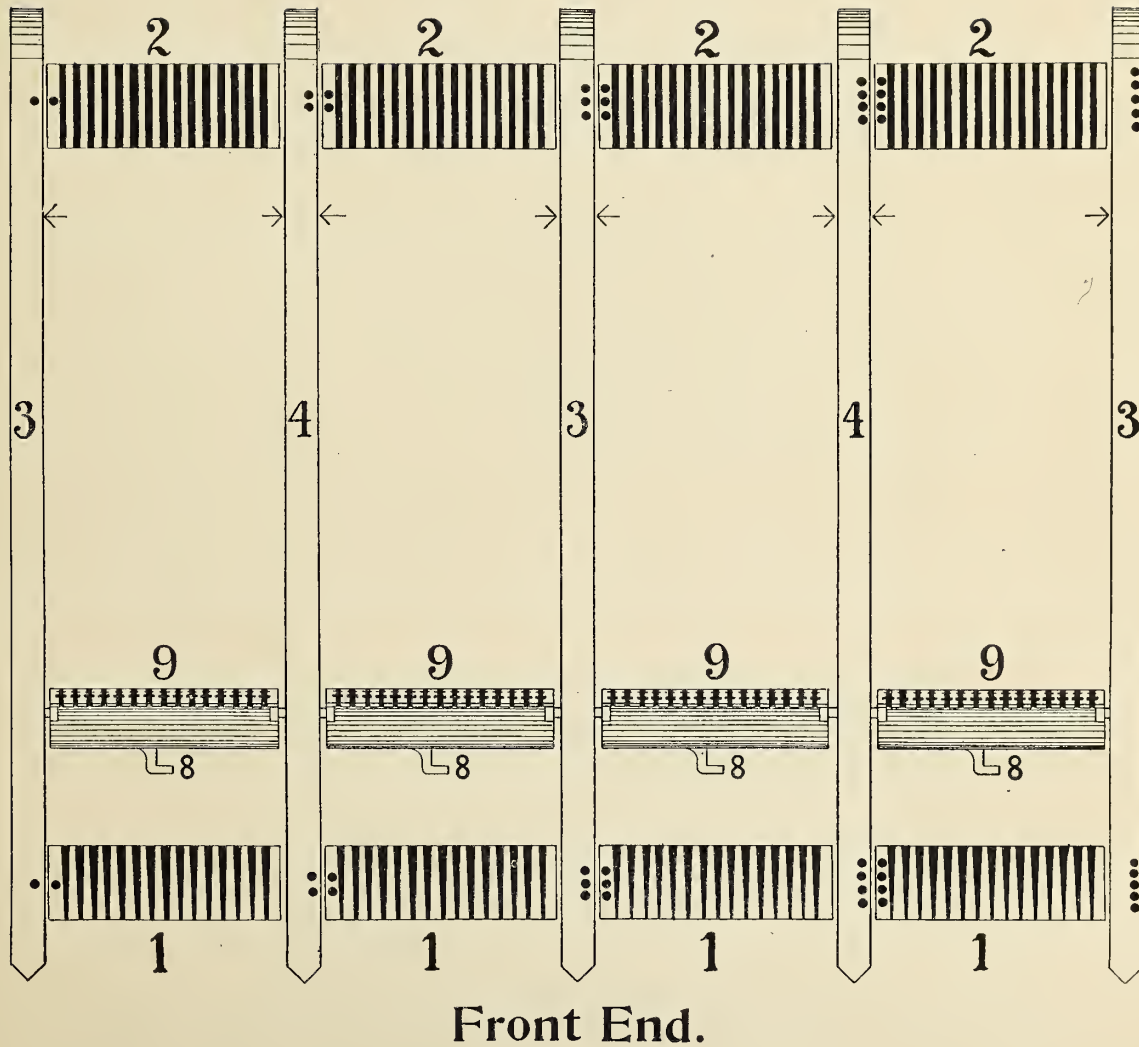


DIAGRAM OF GRATE FRAME FOR A GRATE OF FOUR ROWS OR SECTIONS,

And arranged to have the connecting bar journals in the center of each bar, *i. e.*, center pull, as per Fig. 9.

McClave's Circular Shaking and Double Cut-Off Grate

PATENTED FEBRUARY 20, 1883, AND JULY 12, 1898:

THERE is a constant demand in certain parts of the country for a first class grate adapted to burn all kinds of hard and soft coal fuels in round vertical boilers, and more especially for a grate that can be operated to clean the fire from underneath and drop the clinker and ashes into the ash-pit, thereby preventing to a great extent the waste of fuel and loss of steam, which is unavoidable when the fire is cleaned, as in the old method of pulling the clinkers and ashes out through the fire-door opening.

To meet this requirement, we have placed on the market **McClave's Circular Shaking and Double Cut-Off Grate.**

The construction of the grate bars in this grate is similar to those of McClave's Perfect Grate, in that the fingers or top portion of the grate bars are cast separately, and the body portion of the bars made with sockets to receive the shanks of the fingers. In this case, however, the sockets in the body portion are vertical, and the shanks on the fingers arranged centrally with the top portion, making a practically T formation, whereby a double cut-off movement is secured by forming pockets on either side of the bars, as shown on Plate 25.

This makes a very strong construction, and reduces the cost of repairs to a minimum, as in case one of the fingers should be broken, simply one finger would have to be replaced, instead of a whole new bar as in a solid construction.

The frame which supports the grate bars is below the fire bed, which prevents warping or burning out, and the fingers which cover the frame are made with shanks, the same as the construction of the grate bars, and can be easily replaced if they should be broken or burn out.

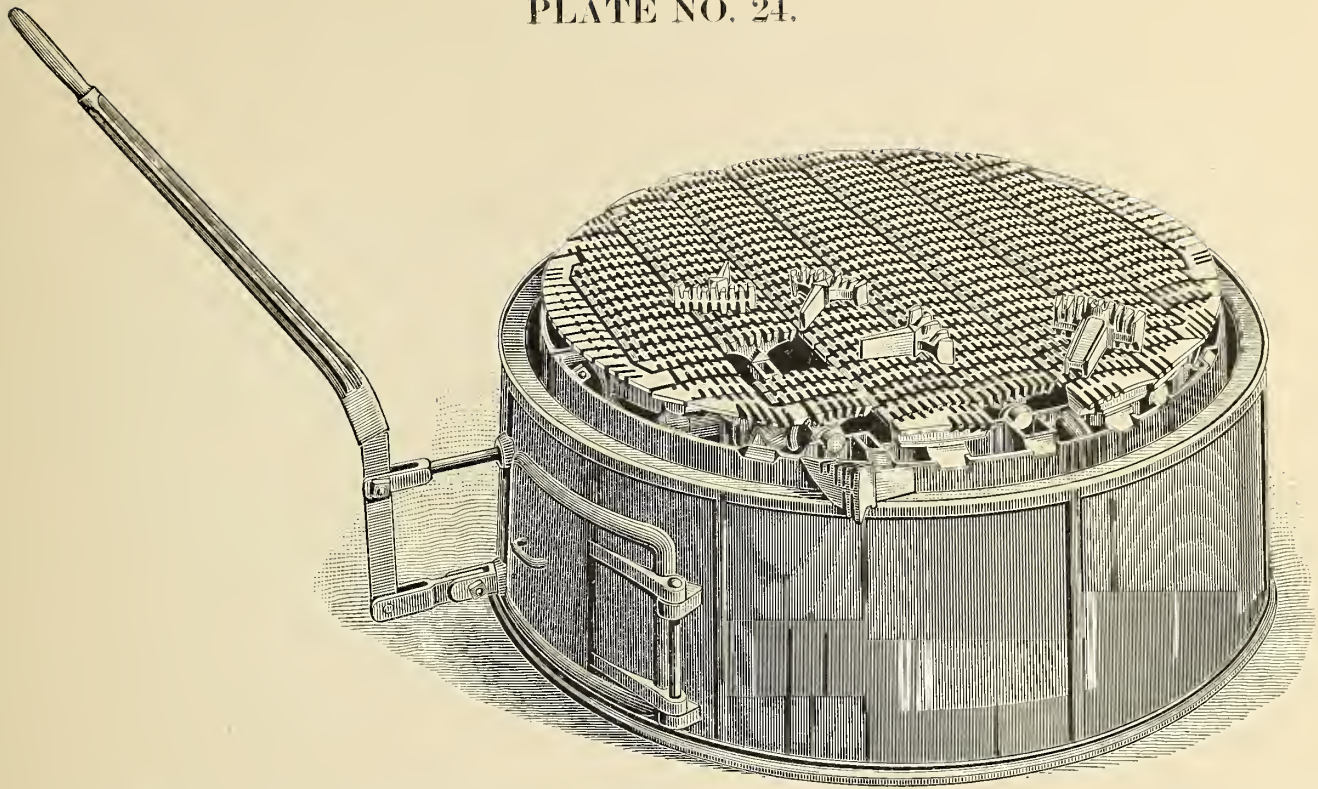
With ordinary care this grate should last as long as the boiler.

The bases generally furnished with vertical boilers are constructed with an ash-pit which is too shallow for a grate that dumps all the ashes into the pit, therefore, for boilers up to 60" diameter, we furnish a sectional base which is constructed suitable for this type of grate. Being made in sections, it can be taken apart and shipped to any point without danger of breakage, and can be readily put together again.

In ordering McClave's Circular Shaking and Double Cut-Off Grates, a blue-print or sketch should accompany the order, showing all the details of the fire-box, and the exact diameter of same at the point where the grate is to be placed, *i. e.*, the distance from the bottom of fire-box to top of grate.

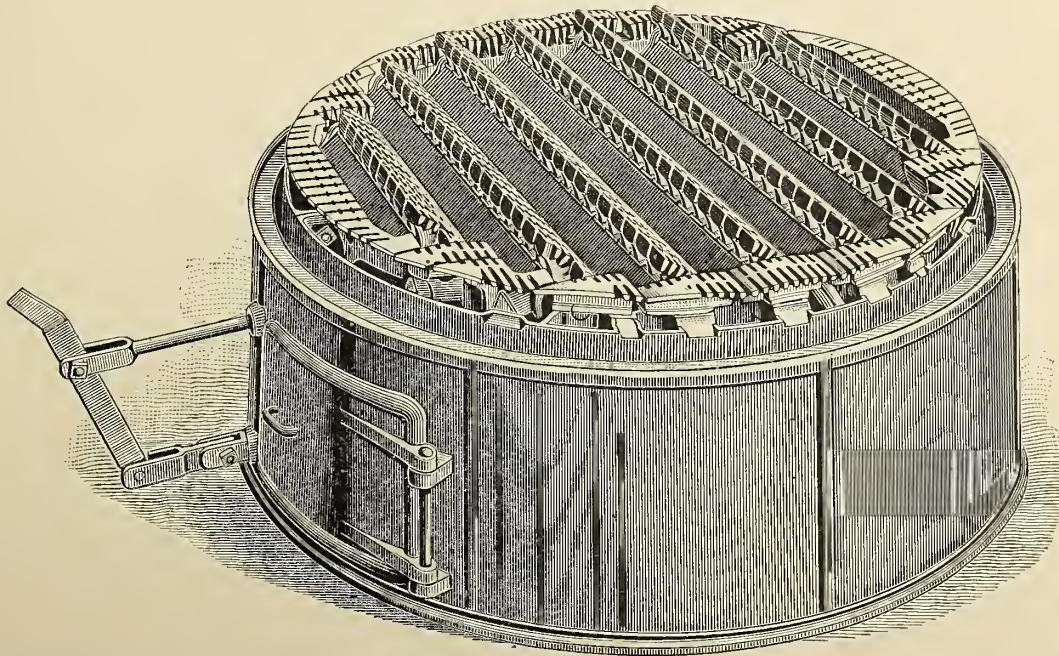
In ordering repairs for these grates, always give the diameter of the fire-box first. If fingers are required either for the grate bars or outside frame, order same by number, as every finger has a number cast on the web of the finger directly under the teeth. If the body portion of the grate bar is required, give length of same not including the journals at the ends. If a section of the frame is required, state whether it is a front or rear section, and whether it is on the right or left-hand side of the center, looking at it from the front of the boiler. The working bar which connects the grate bars together, also connecting rod, and the lever and connections which are on the outside of front, are similar to those described on Plate 9, and can be ordered accordingly.

PLATE NO. 24.



The above cut shows a complete set of McClave's Circular Shaking and Double Cut-Off Grate, for a round vertical boiler, with some of the fingers removed to show the form of construction.

PLATE NO. 25.



Cut showing one of the cut-off movements. By pushing the lever in close to the front the opposite movement is obtained, pockets being formed in either case to prevent the fuel from running through into the ash-pit during operation. A movement to remove fine ash simply, can be obtained by smartly rocking the grates back and forth a short distance instead of forming pockets.

McClave's Stationary Grate.

PATENTED JULY 12, 1898.

On the next page we illustrate a new form of construction for a stationary grate, and for those who desire this type of grate, we have no hesitancy in affirming that this grate will last longer and give better results than any other stationary grate on the market.

The distinctive features which make the grate superior to any other form of construction in a stationary grate, are as follows:

First—The Carrier Bars are made with a truss on the under side, which makes them very strong, and as the top of the bar is $2\frac{1}{4}$ inches below the top level of the grate, it cannot be burned out or warped.

Second—The body portion of the grate bars dovetail into the carrier bars and are likewise $2\frac{1}{4}$ inches below the top level of the grate, and consequently cannot burn out or warp.

Third—The fingers which form the top surface of the grate are cast separately, with shanks which drop into the sockets in the body portion of the bar. These shanks are set a little to one side of the center of the finger, so that the fingers of one bar will interlock with the fingers of the next bar, and the teeth of the fingers interlock with one another so that there are no long transverse straight lines of opening to catch the hoe when cleaning the fire, and also preventing the waste of fine fuel, which is unavoidable in the constructions having long straight lines of opening.

Fourth—This form of finger allows us to make the grate with a very fine and uniform mesh, which has about 50% air space, thereby permitting the use of the smaller sizes of fuel as well as the larger, on the same grate without the loss of fuel through the grate bars.

Fifth—The teeth on the fingers are slightly crowning, so that they are not liable to be broken with the slash bar, as the distance from the center of one finger to the center of the next one is only 2 inches.

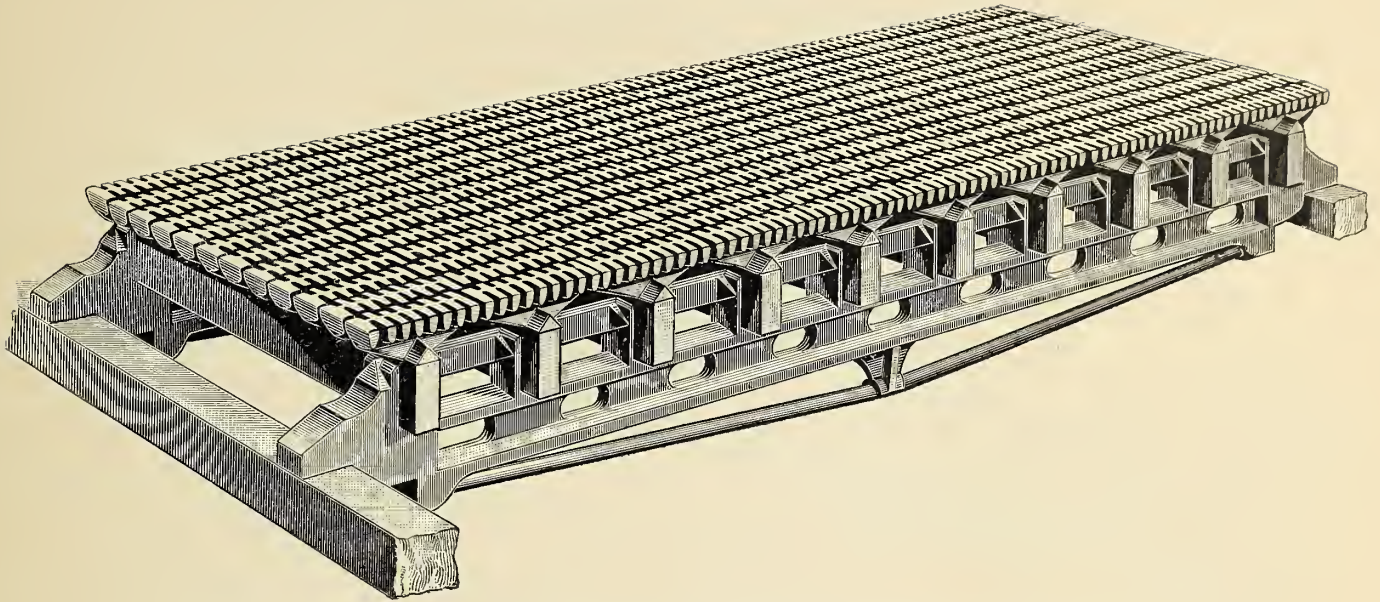
Sixth—In case one of the fingers should be broken from any cause, it can be replaced in a few moments, and simply means the cost of a casting weighing less than 2 pounds.

With these points of merit, we believe that this grate has no equal in the world to-day.

In ordering McClave's Stationary Grate, give the distance between the inner edge of the dead place and back ash-pit wall, and state whether there is a rabbet on the dead plate giving the depth and projection of same. (See Fig. 5, Plate 7, which shows a rabbet on dead plate.) Then give the exact distance between the side walls at the top level of grate.

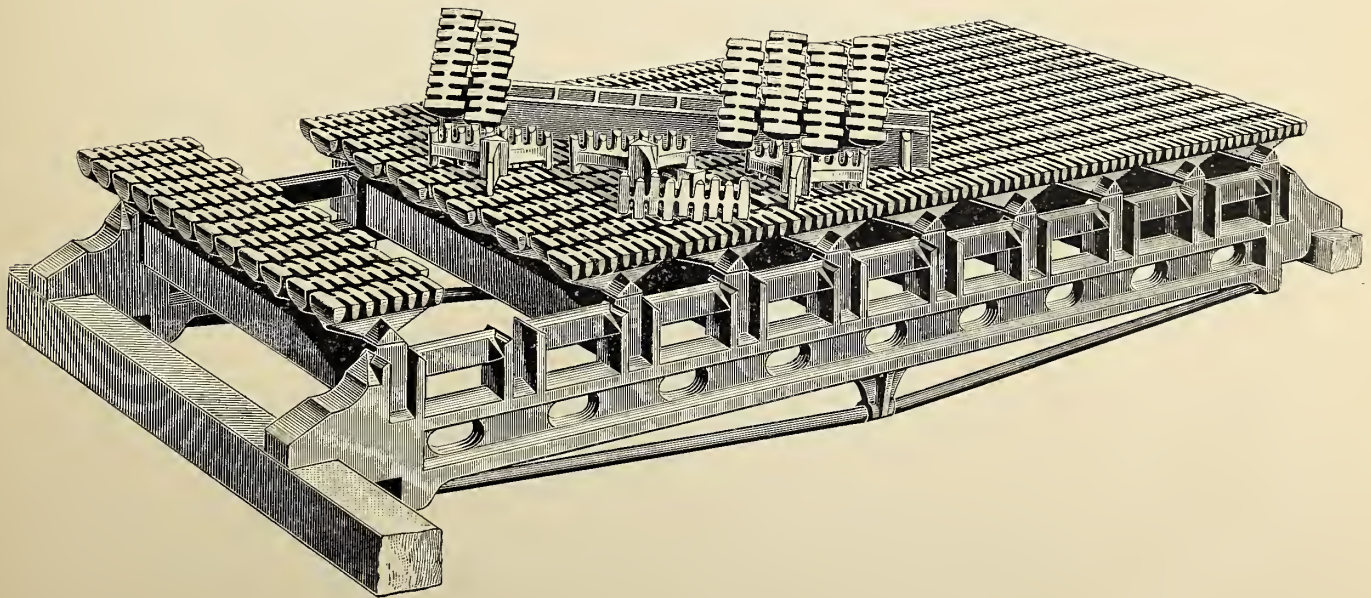
For furnaces up to 6 feet in width, a $2\frac{1}{2}$ -inch square wrought iron or steel bar can be used for front bearer. For wider furnaces, the same sized bar can be used, but must be supported at the center with a bracket fastened to the inner side of the boiler front.

PLATE NO. 26.



Cut showing one row or section of McClave's Stationary Grate.

PLATE NO. 27.

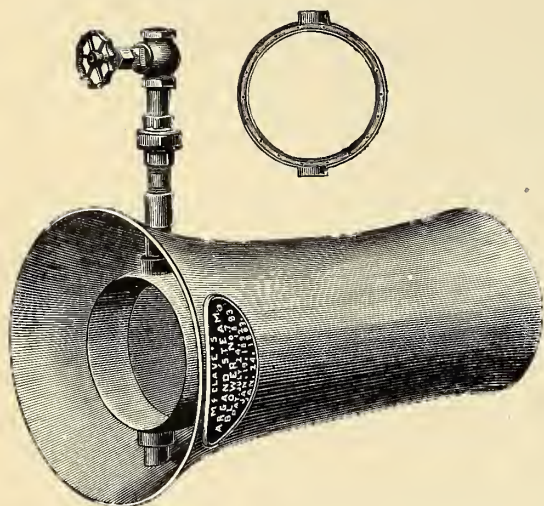


Cut showing one row or section of McClave's Stationary Grate, with one of the grate bars lying on top and some of the fingers removed from same, to show the form of construction.

McClave's Improved Argand Steam Blower.

FOR FURNISHING BLAST TO BURN THE CHEAPER
GRADES OF HARD AND SOFT COAL.

PLATE NO. 28.



Patented July 24, 1883; January 19, 1892;
January 24, 1893.

It is generally conceded by Mechanical Engineers and others who have given the subject special attention, that a blast furnished by undergrate combined air and steam blowers, properly proportioned, is better adapted to burn smaller coal fuels, than either a strong natural draught, or a draught produced by a jet or jets in the stack.

Both of the latter methods so relieve the pressure on the upper surface of the fire, that the unconsumed gases escape into the stack before they have time to ignite, whereas, with the forced draught a pressure is produced between the uptake and the upper surface of the fire, which retards the gases long enough for them to ignite and cause a hot gaseous flame to roll and reverberate through the entire combustion chamber, whereby the boiler can be heated more effectively than by the radiant heat alone which is emitted from the incandescent carbon and radiated against a small portion of the heating surface only.

Then again the steam has a mechanical effect, in that it keeps the clinkers soft and porous, so that the blast will readily pass up through the entire bed of fuel uniformly, instead of being forced to pass between solid clinkers wherever it can find an opening, as is the usual case with a fan blast, for an all-air blast tends to form the clinkers into compact slabs, through which the air cannot pass.

Another mechanical effect of the steam is that it moistens the fine ashes in the lower strata of the fire, which keeps them from being blown up into the burning surface to choke it by filling the interstices between the particles of fuel.

Another feature favorable to a properly proportioned combined air and steam blast, is that each furnace has its own blower, instead of relying upon a single fan with a long conduit and branches leading to each furnace which would be necessary in a large battery of boilers, as it will readily be seen that if the fan stops for any cause, the whole battery would of necessity be without blast.

The Blower that we present herewith is not the crystallized inspiration of a moment, but is the result of over fourteen years' close contact and experience with the problem of more effectually burning cheap Anthracite and Bituminous fuels, such as buckwheat, rice, screenings, slack, duff, coke breeze, etc., in boiler and other furnaces; and, in its present improved condition, is beyond cavil the best blower yet offered to the public. The special merits of the Blower are as follows:

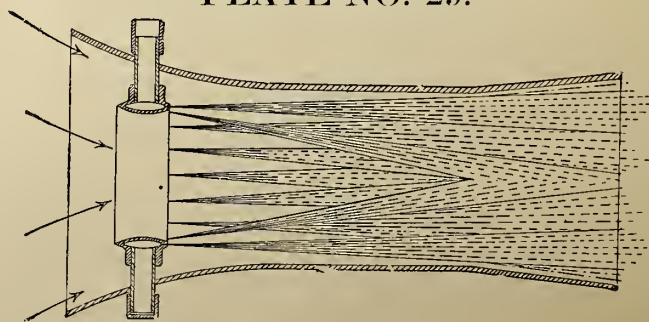
First—It furnishes a large volume of air with a small amount of steam.

Second—The air and steam are thoroughly mixed in the shell, or case of the Blower, before the blast is delivered into the ash-pit.

Third—It makes very little noise in operation.

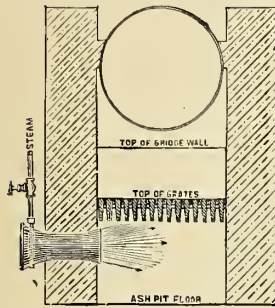
Fourth—When used in connection with McClave's Improved Grates, a complete system is obtained for burning the cheaper, *i. e.*, smaller grades of hard and soft coal, as the grate is especially adapted to burning this class of fuel, and has been adopted throughout by many of the largest concerns in the country with excellent results.

PLATE NO. 29.



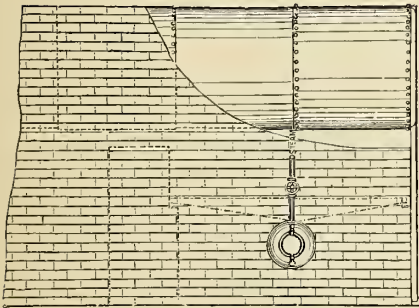
LONGITUDINAL SECTION.

PLATE NO. 30.



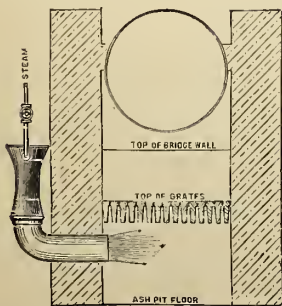
Method of placing a straight Blower through a side wall.

PLATE NO. 31.



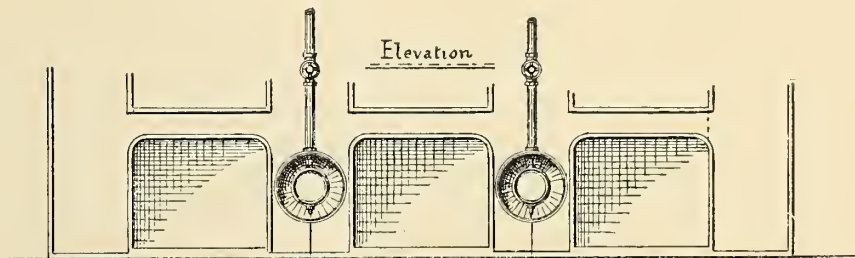
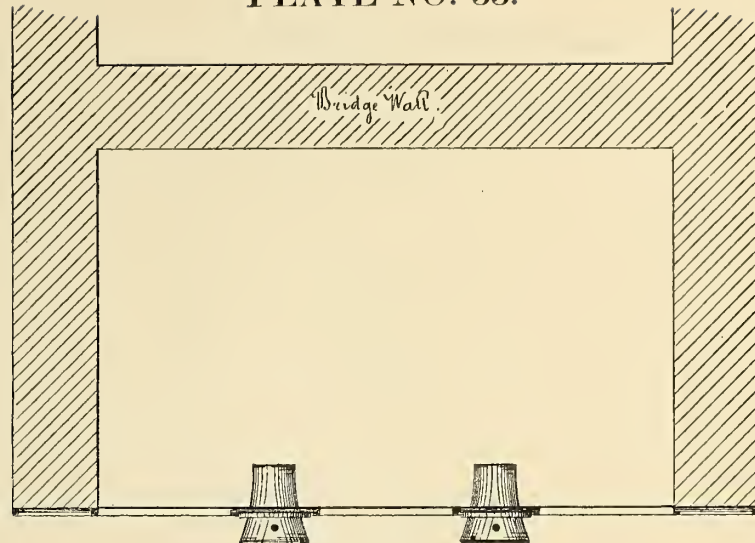
Side view of Plate 30.

PLATE NO. 32.



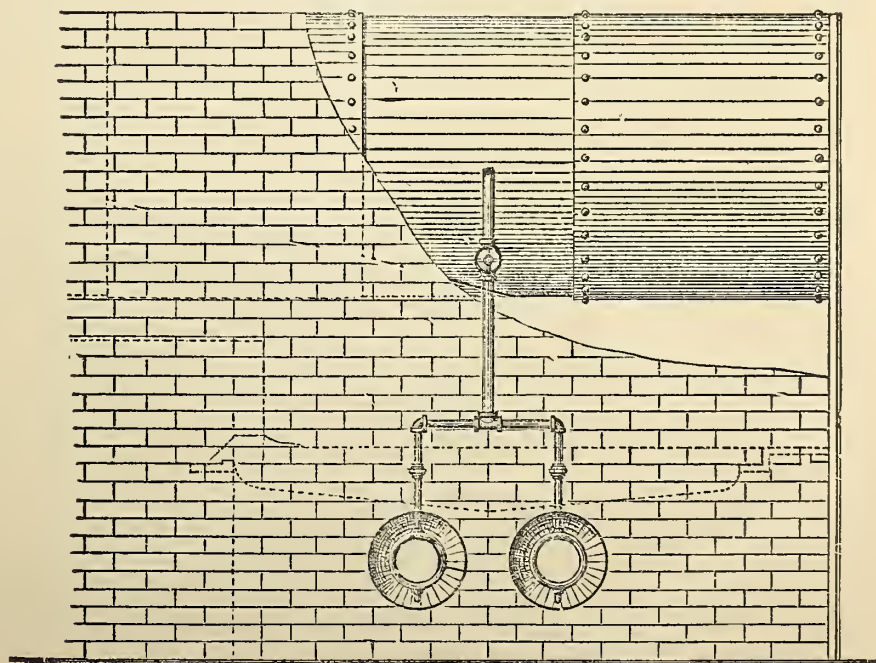
Method of placing a Blower in side wall with elbow.

PLATE NO. 33.



Plan and elevation for placing Blowers between ash doors through the front when there is sufficient space between the doors, as is sometimes the case in nests of cylinder boilers; the blowers for this purpose are 17 inches long and have a flange on them to bolt to the front.

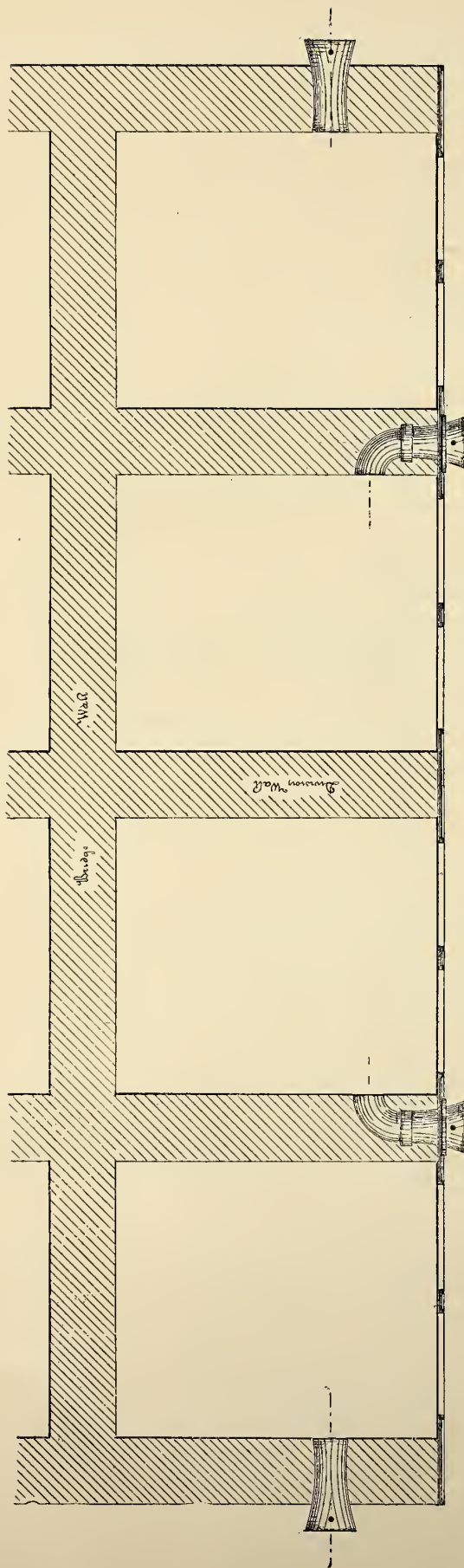
PLATE NO. 34.



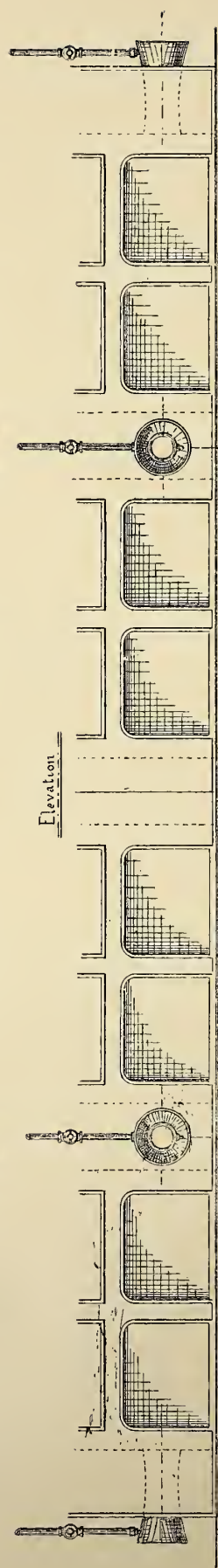
Method of connecting two blowers in side wall or front so that both will be controlled by one globe valve. This arrangement secures greater uniformity in the blast from both, and prevents the ashes from blowing out into the boiler room.

PLATE NO. 35.

Plan.

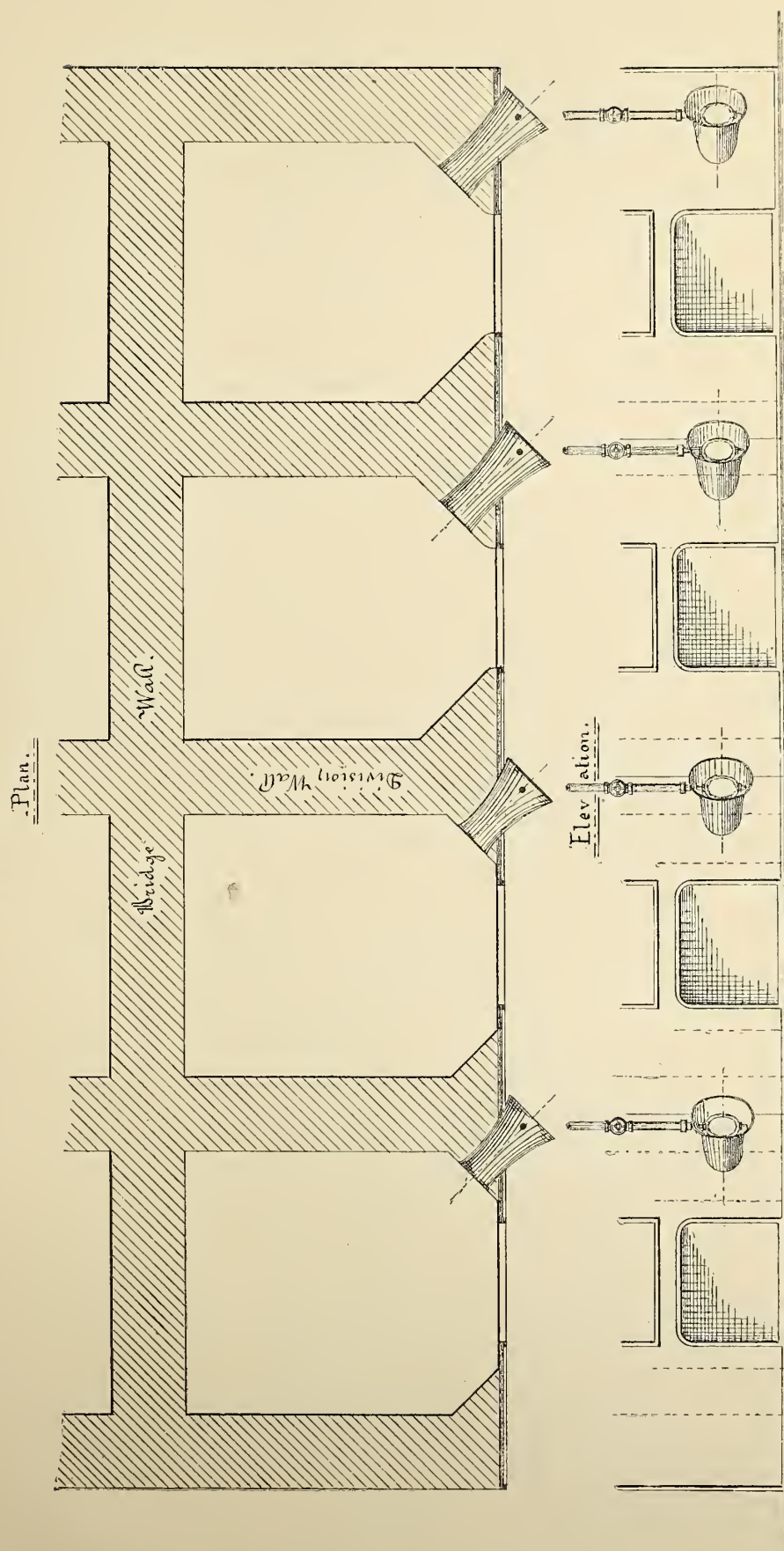


Elevation.



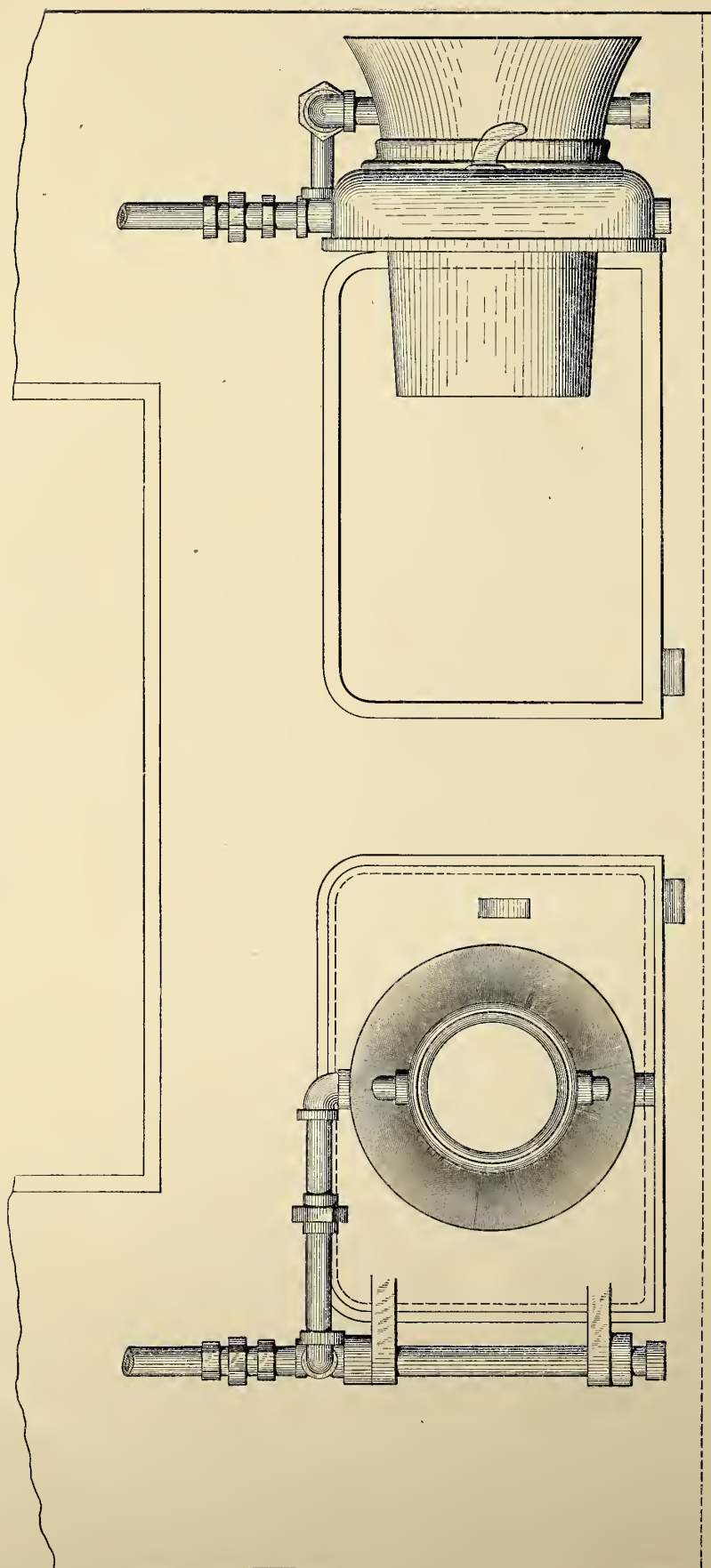
Plan and elevation showing method of placing Blowers in a battery of boilers, viz.: two of the blowers are placed in the division walls through the front and the blast is turned into the ash-pit by means of elbows which may be cast iron or vitrified terra cotta. The shell of the blowers that go through the front are 17 inches long, and the blowers that go in the side walls are either 24 inches or 28 inches long, according to the thickness of the walls. Where elbows are used, a good cement joint should be made around the end that enters the socket of the elbow, and both the blower and elbow built substantially into the division wall.

PLATE NO. 36.



Plan and elevation showing method of placing Blowers diagonally through the front. The blowers in this case may be either 20 inches or 24 inches long, according to the thickness of the brick corner jams, as shown in above plan. This method can be employed when the division walls are not thick enough to place them as shown on Plate 35.

PLATE NO. 37.



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Method of connecting the Blowers to the ash doors when they cannot be placed through the sidewalls or between the ash doors, as shown in preceding plans. In this case, the steam supply-pipe is brought down to and in line with the hinge-pin, the center of the pipe being in line with the center of the hinge-pin. Connection is then made to the Blower as shown above in cut. Just above the hinge-pin a swivel joint is placed in the vertical pipe so as to permit the opening and closing of the ash doors.

Blower Directions.

The Blowers are made in five different sizes, as follows :

	Diameter of Steam Ring.	Outside Diameter of Shell at Mouth or Air Inlet end.	Outside Diameter of Shell at Outlet or Discharge End.						Diameter of Hole required in front for flange blower
			Length.	Diameter.	Length.	Diameter.	Length.	Diameter.	
No. 7 Blower—Shells 20", 24" or 27" long .	7"	13½"	20"	9⅞"	24"	9⅞"	27"	10⅜"	10"
No. 7 Blower—Shells 17" long, with flange .	7"	13½"	17"	8¾"	24"	8¾"	27"	9⅜"	8⅞"
No. 6 Blower—Shells 20", 24" or 27" long .	6"	12½"	20"	8¾"	24"	8¾"	27"	9⅜"	7⅞"
No. 6 Blower—Shells 17" long, with flange .	6"	12½"	17"	7¾"	24"	8⅜"	27"	9⅜"	7⅞"
No. 5 Blower—Shells 20" or 24" long . . .	5"	11⅜"	20"	7¾"	24"	8⅜"	27"	9⅜"	7⅞"
No. 5 Blower—Shells 16" long, with flange .	5"	11⅜"	16"	6¾"	24"	6⅞"	27"	9⅜"	7⅞"
No. 4 Blower—Shells 20" or 24" long . . .	4"	9¼"	20"	6¼"	24"	6⅞"	27"	9⅜"	7⅞"
No. 4 Blower—Shells 16" long, with flange .	4"	9¼"	16"	5¼"	24"	6⅞"	27"	9⅜"	7⅞"
No. 3 Blower—Shells 20" or 24" long . . .	3¼"	8¼"	20"	5 9 16"	24"	6 5-16"	27"	9⅜"	7⅞"
No. 3 Blower—Shells 15" long, with flange .	3¼"	8¼"	15"	4 ¾"	24"	6 5-16"	27"	9⅜"	7⅞"

We can furnish elbows for all the above sizes when required.

The No. 3 and No. 4 Blowers are designed mainly for vertical boilers, and when used for such purpose should always have an elbow, so that the blower will stand vertical by the side of boiler. The No. 5 can also be used for this purpose.

No. 3 will furnish blast for from 4 to 8 square feet of grate surface.

No. 4 will furnish blast for from 8 to 12 square feet of grate surface.

The Nos. 5, 6 and 7 are designed for all kinds of horizontal furnace construction.

No. 5 will furnish blast for from 12 to 20 square feet of grate surface.

No. 6 will furnish blast for from 20 to 30 square feet of grate surface.

No. 7 will furnish blast for from 30 to 40 square feet of grate surface.

A furnace having from 40 to 60 square feet of grate should be equipped with two No. 6 Blowers, and a furnace having from 60 to 80 square feet of grate should have two No. 7 Blowers; placing them through the wall as shown on Plate 34 in Catalogue, if possible.

All short blowers, "with flange," are designed to go through the front, as shown on Plates 33, 35 and 37 in Catalogue.

The Blowers are fitted up with globe valve, union and nipples, ready to attach to steam supply-pipe from boiler.

DIRECTIONS FOR ORDERING.

State the size and style of Blower wanted, giving the page which designates same and plate number.

NOTE.—The length of the blower shell does not determine the size, but the diameter of the ring and shell denote both size and power.

DIRECTIONS FOR SETTING.

When the Blower is designed to go through the side ash-pit wall, as per Plates 30 and 31, it should be set horizontally about midway between the back ash-pit wall and inner edge of dead-plate, the top edge of inlet end of shell generally being about 11 or 12 inches below the top surface of the grate.

The steam supply-pipe for the No. 3 and No. 4 Blower should be ½-inch in diameter, and for Nos. 5, 6 and 7, ¾-inch pipe should be used, in order to bring the full steam pressure from boiler to points of outlet, connecting always with the main steam pipe or dome of boiler.

Where a pair of either No. 6 or 7 Blowers are put into the same ash-pit, as per plates 33 and 34, then in such case a 1-inch supply-pipe should be used from the dome or main steam pipe down to a point just above the pair of blowers, and from thence lead a ¾ inch branch to each blower respectively. The globe valve in such case should be placed in the 1-inch pipe so as to control the steam in both blowers at the same instant. This arrangement of pipes is necessary, no matter where or how the blowers are placed.

After the blower is set and the steam supply connections are made, then adjust the steam ring of the blower so that it will be straight across the shell, viz.: at right angles with the longitudinal axis of the shell.

DIRECTIONS FOR USING.

Regulate the blast to suit the requirements by the globe valve in the steam supply-pipe. If the small holes should become clogged with loose scales from the steam pipe or other cause, they can be cleaned with a small wire (bent in the form of a hook), when the steam is turned on full force, but *never* use a tool to clean them that will either make the holes larger or ream them tapering, as the steam, to be effective in drawing in air, should issue from holes that have the same diameter all the way through the metal, and should blow from every outlet in the ring. There is no necessity for turning the Argand ring around to clean it, as the wire hook can be pulled back into the small holes when the steam is turned on. A wire hook for this purpose will be sent with each shipment of blowers and will be found attached, with the tag, to the Argand-ring. After a few days' use, when the scale from the pipe will be thoroughly blown out, the blowers will need scarcely any attention as to cleaning.

In all cases where anthracite culm is used for fuel it should be sprinkled with water before putting it on the fire, not so as to make it sloppy and heavy, but just enough to make the dust adhere to the particles of buckwheat. Anthracite screenings from coal yards, should be treated in the same manner, and if they have lain out in the weather for any considerable length of time, it will be found advantageous to mix them with about one-fifth their bulk of bituminous slack, where it is available.

IMPORTANT.—A very simple, yet very important feature in burning fine fuels successfully, where the Argand Blowers are used to furnish blast, is to close the damper in the chimney, or stack, to a point where the burning gases will not blow out through the fire-door when opened, for where there is a strong chimney or stack draft in connection with the under grate blowers, a large percentage of the gases escape without igniting. Therefore, do not fail to so regulate the damper that the largest possible volume of gaseous flame may be produced in the furnace. Where the chimney draft is weak, it may be necessary to keep the damper wide open, but we have found that in the majority of cases it is not only beneficial, but absolutely essential, to regulate the dampers as described, in order to produce the best results.

